MODERN Machine Shop

HOWARD CAMPBELL, Editor

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A Magazine for Machine Shop Executives

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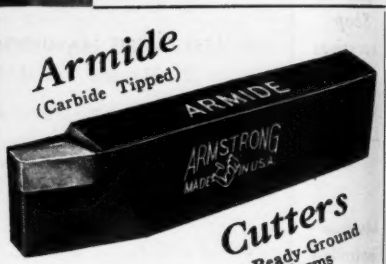

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MODERN Machine Shop

APRIL, 1932

CINCINNATI, OHIO VOL. 4, NO. 11

"Ideas" From the N & W Shops At Portsmouth, Ohio

(CONCLUDED)

Spring rigging work departmentalized — Overhauling triple valves by production methods — Time-saving devices for yard work

By PHILIP WINTER

PISTON valves are easily held, while dismantling and assembling, by the use of the clamping device shown in Fig. 11. This device is of simple design and construction, consisting of two 6½x6½x16½-in. blocks cut to fit the contour of the valve and hinged together. The lower block is anchored to the bench and also to a plate which forms the lower part of the hinge. The other plate is bolted to the top of the upper block, the two plates being hinged together by means of two sections of bar iron and two hinge pins. Not only can the upper block be swung upward, but it can also be swung back to clear the bench entirely. A 1½-in., 4-thd. screw and nut with four handles form the locking mechanism.

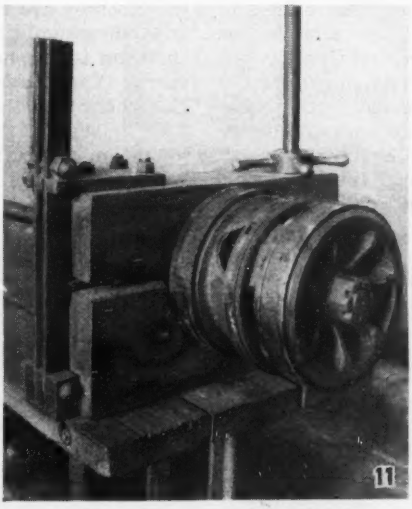

Fig. 11—Piston valves are held in this device while dismantling and assembling.

As brake and spring rigging assemblies are removed from the locomotives in the erecting shop, they are disassembled and put through the customary cleaning process and then are brought to the department illustrated in Fig. 12. Here they are "painted" with crack detector, then they are placed on a bench where the old bushings are removed and new ones put in. This is done

Fig. 12—All spring rigging work is done in this department.

with the aid of the power hammer shown in the center of the illustration. This machine was built in the shop. The cylinder is 6 in. in diameter and 2½ ft. long, and has a 60-lb. hammer at the end of the piston rod. The operator is shown with his hand on the lever by which the vertical movement of the piston is controlled. As the parts are fitted with new bushings, they are passed on toward the other end of the bench, where the sets are made up again and removed as needed. The grinding machine shown was placed in this department for the express purpose of grinding the bushing used in the brake and spring rigging. Segregating the rigging work in an individual department in this manner makes it easier to keep track of the parts and simplifies the task considerably.

Another department in which modern production methods have been inaugurated is the department in which the triple valves are overhauled, shown in Fig. 13. This department occupies a corner of the room, with a wide, steel-plate-covered bench forming the four sides of a square. The department is laid out and equipped for two gangs of four men each, although the illustration shows but one gang working, with two testers. As the valves are brought in, they are dumped into a bin which forms a section of the bench, shown at the left in the illustration. From the bin they are taken by a workman, who disassembles them and passes them on to the next man, who cleans them. The third mechanic re-assembles them, and the fourth tests them. The valves can be passed from one operation to the next without requiring the men to leave their benches.

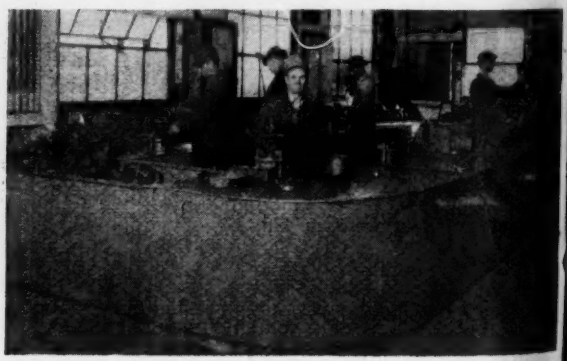

Fig. 13—The consecutive-operation method is used in overhauling triple valves.

After testing, the valves are removed from the far end of the bench and stored.

A simple but useful contrivance is shown in Fig. 14, consisting of a horse made to support the end of a car wheel axle when one wheel is off, thus keeping the end out of the dirt. The stand is made of pieces of pipe welded together.

Cast steel wheel centers that have become badly worn are built up by welding with the electric arc welder, as shown in Fig. 15. The wheels are swung between centers so that they may be revolved and the point of contact thus maintained at a convenient position for the operator, and a bead of material is laid on of sufficient thickness so that the wheels may be put into a wheel lathe, later, and turned to standard diameter. This process makes it possible to reclaim the wheels at a comparatively small cost.

Although the tool shown in use in Fig. 16 is a commercial article, the ease with which it is used to perform a task that formerly required the services of several men makes it worthy of mention here. The tool is a "Joyce" journal jack, and it is used to raise a car axle so that the worn brass can be removed from the journal box and replaced by a new one. One man, using this tool, can raise an entire corner of a car with one hand and remove and replace the brass with the other, as shown in the illustration. Before this tool was developed, it was standard practice to raise the corner of the car by means of jacks, involving the time of several men and no small amount of labor.

The mechanics shown in Fig. 17 are assembling a draft gear to the coupling mechanism of a car, using an "elevator" which raises the gear into place and holds it there while it is being anchored in place. The "elevator" consists of a small four-wheel truck, carrying an 8-in. air brake

Fig. 14—The stand keeps the end of the axle out of the dirt and aids in assembling the axle to the wheel. Fig. 15—Building up worn wheel centers by electric welding. Fig. 16—By using a journal jack, one man can replace a brass in a journal box.

cylinder that is mounted vertically. To the end of the piston rod is welded a section of heavy steel plate, large enough to hold the draft gear. A length of air hose connects the cylinder with an air valve, of which there are a number located at regular intervals throughout the yards. This piece of equipment has repaid, many times over, for the time and material required to make it.

Fig. 18—Column bolt nuts are screwed on with this air-operated wrench.

Another device by means of which a laborious task has been reduced to a simple operation is shown in use in Fig. 18. This tool is an air-operated wrench with which the column bolt nuts on car trucks are removed and replaced. These nuts were formerly screwed off and on by the use of a heavy, long-handled wrench with which the nut could be revolved a quarter-turn at a time. The tool shown in the illustration is designed with a socket for the nut, the socket being made integral with a 44-tooth gear. Meshed with the gear is a 16-tooth pinion, the shaft of which is inserted into the sleeve of an air motor. The entire mechanism is mounted on a truck which consists of a section of heavy steel plate and two wheels, as shown, a length of air hose being attached to the air motor. To use, the socket is slipped over a nut and the air turned on. With this device a nut can be screwed on or off in a fraction of the time formerly required.

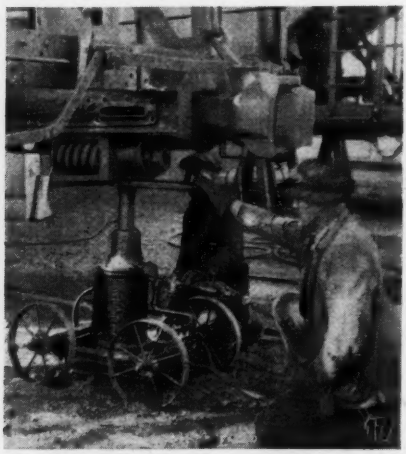

Fig. 17—The air-operated "elevator" holds the draft gear in place while it is being assembled to the coupling mechanism.

Our Apologies

The article "Keeping An Unemployment Score," which appeared in the March issue of MODERN MACHINE SHOP, was erroneously attributed to E. E. Burke, who is Sales Manager of the Kent-Owens Machine Co. The author of this article was Leon Pearce.

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Schedule Methods for Plant Maintenance

By J. J. BERLINER

PLANT maintenance, important and vital as it is, is often overlooked in the scheme of unified plans and schedules for getting work done. In the operating or production departments there are always methods—of one kind or another—for scheduling work, but in the construction and maintenance departments this situation is the exception rather than the rule. Yet engineers, plant superintendents and maintenance foremen are not unappreciative of the advantages that might be secured by putting schedule methods into effect in their work.

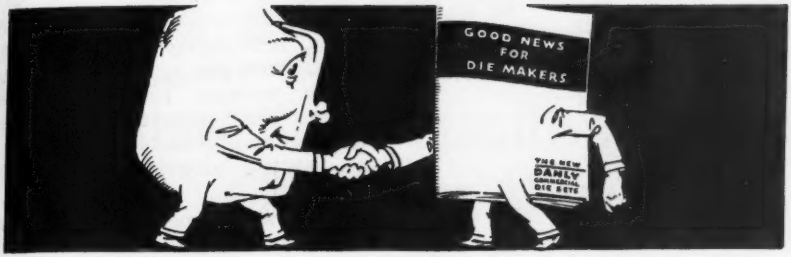
The economies to be derived are very important. The urgency of a particular job necessitates a schedule. The value of the co-ordination of the work pertaining to one or more than one job is immeasurable. The necessity for eliminating—or at least reducing—the possible delays to production to a minimum stands out almost paramount to all.

Maintenance or construction work can be planned and scheduled by means of a system which may be of a simple skeleton form in the small organization, or possibly a division of a highly developed production control department in a very large organization. But whatever the policy or methods of carrying on work, there should be some sort of a "forward picture" of future work to be done.

NAME	WORK TO BE DONE	JANUARY													
		1st							2nd						
		1	2	3	4	5	6	7	8	9	10	11	12	13	14
ELECTRIC REPAIR SHOP															

Fig. 1—Control Board Used for Scheduling Maintenance Work.

"Hello Pocketbook"



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WORK ORDER RECORD

Construction Only

No.	Name of Job	Function	Quantities	Time Elem.	Man Hrs.	Assignment	Authorized Est. Cost	Actual Cost	Budget No. Item	Total Job Cost

Fig. 2—Record of Construction Work Orders Issued.

Hence a definite list of jobs or pieces of work to be done should be made up for both maintenance and construction. These jobs should be indexed and then scheduled, using present available man-hour capacity.

The best way to do this is by means of a control board with a section for each group of workers. Thus electrical maintenance would have one section, millwrights another, carpenters another, and so on. By having definite working periods available, capacity could always be anticipated and each new job could be fitted into the existing program or summary schedule.

A very simple method, and one that is useful both for large and small forces, is shown on the control board schedule, Fig. 1. In all cases each group of workers would be scheduled on one section of this board. The use of the board is very simple. In the usual case—for example, a small electrical repair shop—the name of the workman would go in the column "Name." Under "Work to Be Done" would appear the function of work (for example "rewind field coils"); for the dates would be given the time allowance, indicated by a small card which would be labeled by work order number and, in case of a fractional day, by the number of hours. This card would be inserted between two horizontal wires directly opposite the "Name" and "Work to Be Done." In the larger organization it would be sometimes advisable to replace the name of the worker with that of a group of workers or possibly of a foreman.

The control board would indicate at all times the available capacity, would show clearly the individual jobs assigned to each person or group of persons, and how much current time is available for new work. Also, it would readily show the scheduled

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DAYTON, OHIO

M——.....

SCHEDULE

Work To Be Done	Start Day & Hour	Complete Day & Hour

(Reverse)

M——.....

WORK ORDER

Est. Cost..... Date 4/11

Work To Be Done	Assignment	Day	Hour

(Face)

Fig. 3—Sample Work Order Form.

starting and completion dates. It is simply a condition report set up in schedule form.

In order that the control board may be most useful and most accurate, two other requirements are necessary. The first of these is in the use of a proper "work record," for which a form is shown as Fig. 2. Fundamentally, this is a record of the job and also gives the supporting data necessary to the proper operation of the control board. Under the proper columns are listed the various functions, the corresponding quantities of work, unit time elements, total man-hours, and name of persons or group of workers to whom the particular task is assigned. The man-hours and assignment will be secured or set up either by the person maintaining the record or by the foreman; preferably the latter, in the small organization. In either case, of course, the assignment would be made after due reference to the control board, otherwise it would be in the nature of a good guess and would render useless the operation of the board.

The information required for the operation of this record, and obviously for the proper operation of the control board, should be developed by means of some form of job standardization. In a very simple case a formal record should be established of time elements required to perform each function. For the more elaborate record, data should be collected on the time elements for fundamental operations or motions. These, when totaled, would give the schedule time allowance. In any case these data should be indexed and filed properly according to some system which can be improved and built up as additional data are obtained.

The second requirement for the proper operation of the control board is a satisfactory work authorization. This would usually be a notice to start new work or a confirmation of a verbal order. In either case it should take the form of a tag which could be returned by the assignee upon completion of his particular function.

Here again there should be certain definite essentials which could be varied with the form and size of the organization. First, and very important, there should be two serial numbers for use in authorizing work, one for construction—fixed capital, additions, betterments or replacements—and one for maintenance or repairs. Incidentally, whether these numbers would be issued by the department in

(Continued on page 61)

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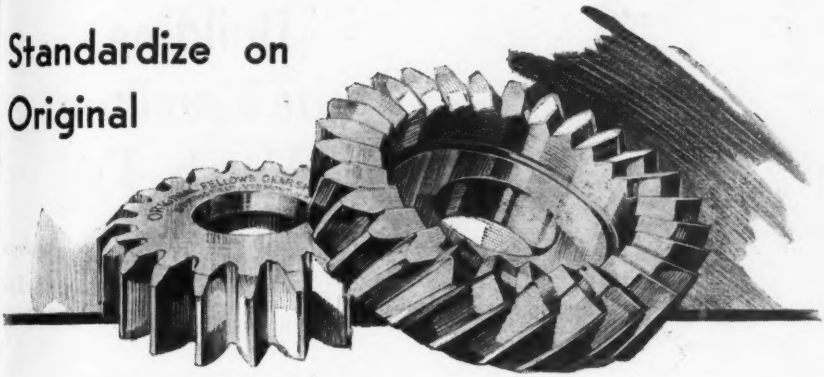

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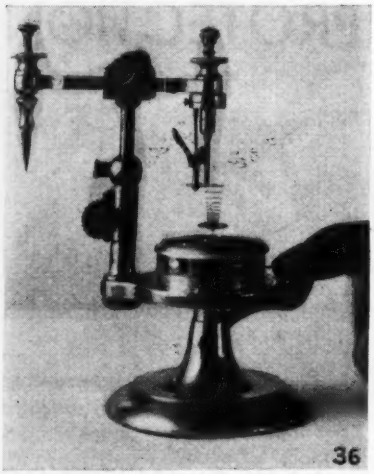


Fig. 36—Oscillating the hairspring to determine the correct length.

Building the Hamilton Watch, IV

Lapping gages of 0.0028-in. diameter — Inspection methods — Assembling and testing the watches.

By HOWARD CAMPBELL

ALTHOUGH provision is made for regulating a watch, within certain limits, the accuracy with which the time-piece records the passage of time is dependent largely upon the length of the vibration period of the hairspring. And the length of the vibration period is determined by the length of the spring itself. The longer the spring is, the longer the period of oscillation will be; consequently the task becomes one primarily of finding the correct length of each individual spring.

To assist in the performance of this task, the device shown in Fig. 36 is used. The spring is assembled to its balance wheel, then the free end of the spring is slipped into a slot in the spindle of the device, as shown, with the spring and wheel hanging. The operator now gives the spindle a quick half-turn with his thumb and finger, which starts the spring oscillating. At the same time he releases a mechanism which oscillates a disc in the glass-covered case on the table of the device at a rate of 5 times per second. The mechanism is similar to a watch movement and is activated in the same manner. If the spring is of the correct length, the oscillation period of the spring will coincide with the oscillation period of the disc. If the spring is too long, it will lag, and if it is too short, it will oscillate too fast. However, all of the springs are made too long so that the operator can cut them to the required length. Thus he alternately oscillates and cuts the spring until it is of the correct length to oscillate in unison with disc.

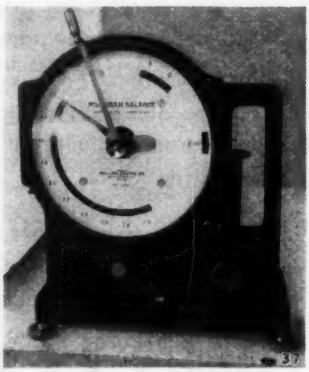


Fig. 37 — Milligram balance with which balance screws are weighed.

In order for the watch to operate

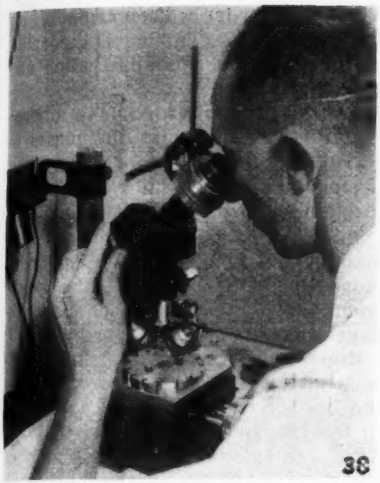


Fig. 38—Using a toolmakers' microscope to check the dimensions of the escapement parts.

properly, the balance screws must also be of the proper weight, according to the size of the balance wheel. One of these screws, for a watch of the smaller type, will weigh about one milligram. This is equivalent to 454,000 screws for a pound of 16 ounces. In order to make sure that the screws for a watch are all of equal weight, they are individually weighed in the milligram balance shown in Fig. 37. The little door at the right front of the balance is opened and the screws are placed on the scale, then the door is closed to prevent air drafts from influencing the weighing process.

The operator shown in Fig. 38 is using a Bausch & Lomb toolmakers' microscope to check the lengths, angles, and thicknesses of the parts which form the escapement—the pallet and escape wheel. To check the impulse angles of the escape wheel, the wheel is located in the center of an index plate, and crossed hairs in the microscope are aligned with the angles of the wheel. The rings across which the hairs are suspended are graduated so that the angles of the wheel faces can be determined by the graduations on the rings; thus the machines in which the wheels are cut can be set accordingly. As the production rate is high, one wheel out of approximately 200 is inspected with this microscope.

To make sure that the holes in the jewels are of the correct size, they are gaged with plug gages in the same manner as larger holes, but these minute plug gages range in size as small as 0.0028 in. These gages are made from music wire that is from 0.001 to 0.0015 in. larger than the finish diameter of the gage. The wire is cut to lengths of approximately 1¼ in., then it is hardened, after which it is broken to lengths of approximately 0.200 in. and the pieces

Fig. 39—Lapping gages to a diameter of 0.0028 in.

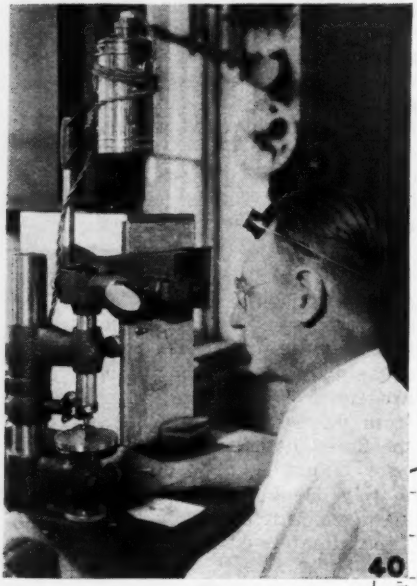


Fig. 40—With this instrument the diameter of a small gage is determined within 0.00001 in. Fig. 41—Scale in Zeiss optimeter. Fig. 42—Stamping the letters and figures on the dial.

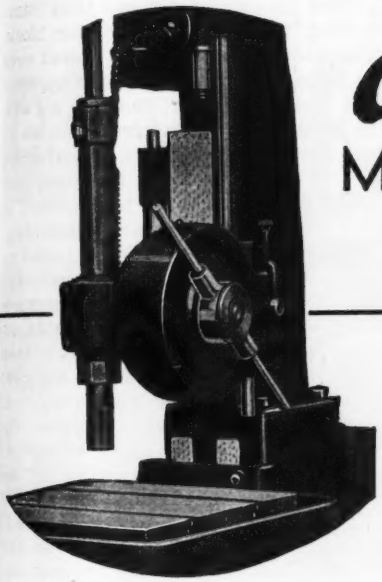
41

are finished to the required diameter by lapping to a tolerance of 0.00001 inch.

The lapping machine, shown in Fig. 39, is vertical, with a flat disc lap that is revolved, with an eccentric movement, by the spindle. The work is laid on a flat, round surface plate with an edge just high enough to hold the pieces from slipping off under the action of the lap. One of these plates, loaded with gages, is shown on the table of the machine and another on the bench. The pieces are first rough-lapped by placing them on a large plate which has a capacity of approximately 1,000 pieces and lapping them with No. 65F Alundum powder. Then from 175 to 200 are placed on one of the small plates shown in the illustration and they are lapped to finish size, using Diamondtine powder. A small amount of oil is dropped onto the pieces to serve the double purpose of holding the pieces on the plate and to aid in the lapping process.

In order to keep track of the amount of stock that is being removed and thus prevent the gages from being lapped undersize, the gage-maker times the operation with a stop watch. He knows from experience just where to set the weight on the bar by which pressure is applied to the lap, and just how long it takes to remove a given amount of metal. On extremely small gages, approximately 0.00001 in. of surface is removed in one minute. Larger gages take longer accordingly.

Such work is entirely too fine for the ordinary micrometer; these gages are inspected for size by the use of the Zeiss optimeter shown in Fig. 40. The piece is placed on a block on the plate which forms the table of the instrument, and



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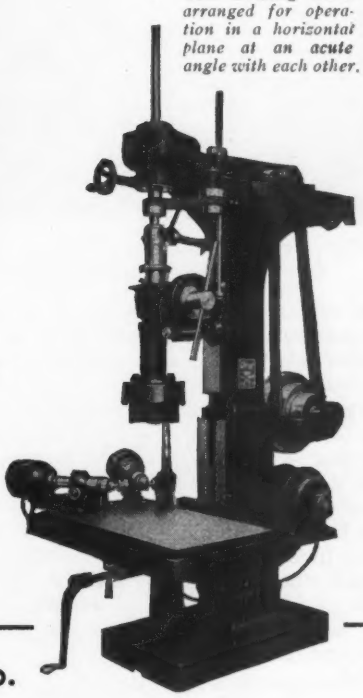

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the plunger is lowered to contact with the piece. By looking into the aperture in the hood at the right of the plunger, the gage maker reads any variation in size from a predetermined setting on an illuminated scale. The scale is reproduced in Fig. 41.

Fig. 43—Test room, showing racks filled with Hamilton "Railroad" watches under test.

The readings by figures are in ten-thousandths of an inch, and the gage-maker easily estimates to hundred-thousandths.

The illustration Fig. 42 shows how the letters and figures are stamped on the dial. The design is first laid out and sunk in a steel die. The die is then placed upon a sliding plate on the table of the hand press shown in the illustration, together with a round, flat steel disc upon which each dial in turn is placed for stamping. To the ram of the press is attached a round, flat rubber block.

When ready to operate, the operator smears a small amount of printing ink on the face of the die and rubs it into the engraved lines which form the design, following which he removes the ink from the face of the die, leaving it in the lines. He then brings the ram down, pressing the rubber into the design and thus transferring the ink to the rubber block. The sliding plate is then shoved over to bring the dial into alignment with the ram and the ram is again brought down, transferring the ink to the dial. The operation is performed in much less time than it takes to tell about it.

After assembling, each watch is tested by running for a period of 24 hours in each of five positions, and after adjustments have been made it is run five days longer for "rating." It is assumed that the watch may be carried in any position by the user excepting that of upside down. Figure 43 is a view of the test room showing the racks filled with Hamilton "Railroad" watches. Any irregularity in the behavior of a watch under test is noted and reported, and the watch is disassembled for examination. All watches are given this same test, and each must demonstrate that it will function perfectly before it is allowed to leave the "Capitol of Time" to aid in regulating the affairs of the world.

(The courtesy of the National Jewelers' Publicity Association is hereby acknowledged for a number of the illustrations used in this series.)

The Soviet automobile plant, now in the course of construction at Nizhni Novgorod, Russia, will be second only to the River Rouge plant of the Ford Motor Company as the largest automobile factory of its kind in the world. The main structure has been finished. The factory is modeled after the Ford works and cost, with its adjoining workers' town, about $154,000,000. The plant is expected to produce 120,000 passenger cars and trucks annually.

CONSIDER THESE 4 facts TO GET LONGER AND BETTER VISE SERVICE

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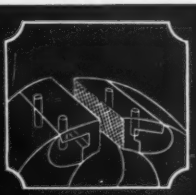
RENEWABLE STEEL JAWS milled to fit and pinned on. They cannot work loose. Not a face jaw, but one that covers entire top of vise with steel.

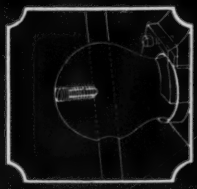


A SWIVEL THAT GRIPS LIKE A GRIZZLY

It gives a gripping power 360 degrees of the base. By tightening up the wedge nut, a ring expands against the side walls of the base and holds the vise solidly anywhere you put it.

A SOLID UNDERPORTION

A solid casting instead of the usual hollow type greatly strengthens the slide where strength is needed. The outside saddle allows screw to be easily removed for lubrication.



THE HANDLE STAYS PUT

A set screw and spring in the handle holds it wherever it is left, and does not allow it to drop down and pinch the operators' fingers.

THE CHARLES PARKER CO.
Master Vise Makers
MERIDEN, CONN. New York Office: 101 Park Ave.
Makers of the famous Parker Gun

Bearings That Lubricate Themselves

Here is a bearing that carries its own oil, and produces it automatically at the proper time and place

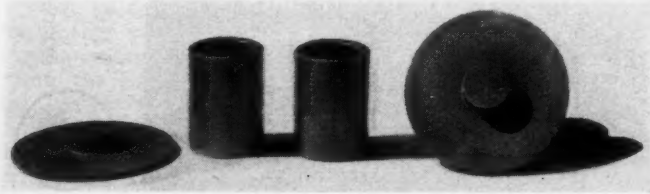
By DONALD A. CLARK

THE first thing an apprentice boy in a machine shop learns — and the last thing he remembers—is that all bearings have to be oiled at regular intervals. It is the first law of engineering that friction must be eliminated between moving parts that are in contact, and the best way to eliminate it is by the use of oil, yet more mechanical units fail due to lack of oil in the proper place at the proper time than for all other reasons combined. Either the operator fails to oil a machine through pure carelessness, or he is too anxious to keep his machine running due to the fact that he may be working piece work, or he sticks the end of the spout in an oil hole and assumes that the oil is running without making sure that there is oil in the can, or he squirts oil into a hole that is so clogged with dirt that no oil can get through.

This condition has existed since the first shaft was encased in a bearing, and has given birth to many attempts to find a method of making bearings that would not require oiling. In later years there have been several types of "oil-less" bearings placed on the market, of various degrees of efficiency.

Now, however, a bearing has been developed that is "oil-full" rather than "oil-less." This bearing carries its own oil, and acts as automatically as an electric clock to produce the oil at the proper time and place. It never forgets; it uses just the right amount for the job, and it oils the entire surface of the bearing—not just one or two points. This bearing is now being manufactured by the Amplex Manufacturing Company, 7900 Jos. Campau Ave., Detroit, Michigan, and is called by the trade name of "Oilite." The Amplex Manfg. Co. is a division of the Chrysler Corporation, and the Oilite bearing was first developed through experiments in an effort to discover a method of making a bearing that could be used in those places where no one ever puts enough oil—in the shackle pin bushings, king pin bushings of an automobile, and so on. The experimental engineers succeeded in producing a bushing that, while seemingly solid, actually contains from 30 to 35 per cent of oil by volume. All that is needed to produce the oil on the surface of the bushing is heat or pressure, but it always produces just enough for lubrication—never enough to drip.

The Oilite bearing is made from pure virgin copper in the powdered form, to which are added tin and



"Oilite" Bearings and Inserts

Sharp

AND STRONG AS THE TEETH OF A WOLF...

THERE are cheaper blades than the ones in the plaid box—cheaper in first cost, but when you figure on performance and uniformity, Lenox hack-saws more than hold their own.

Test them any way you wish—in comparison with others at any price. Cut for cut, blade for blade, dollar for dollar, Lenox quality and uniformity are cheapest in the end.

Lenox blades are bought on performance—ordered and re-ordered because they stand the test. Standardize on *"The Blade in the Plaid Box."* Ask your dealer about them.

LENOX
HACK SAWS
BAND SAWS

AMERICAN SAW & MFG. CO.
SPRINGFIELD, MASS., U.S.A.

Buy "the Blade in the Plaid Box"

graphite. The copper is powdered to such fine grain that all of it can be passed through a 100-mesh screen and a large part of it will pass through a 300-mesh screen. The materials are weighed out according to formula and briquetted under a pressure of 50,000 pounds to the square inch. The briquette is strong enough to stand normal handling, but no pressure. It is then given a special heat treatment under which the briquette changes characteristics and color, and is transformed from a mechanical mixture to a bronze.

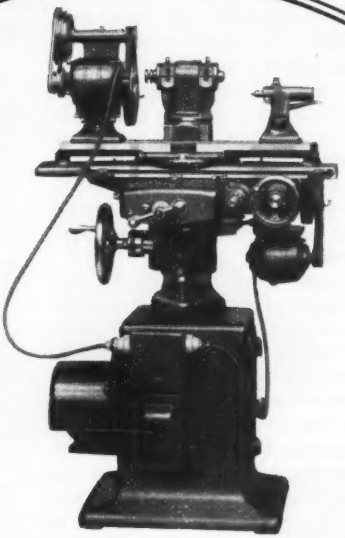
After the bearing has been heat-treated, instead of being weak and fragile, it is exceedingly tough and ductile and will withstand a vast amount of abuse. At the same time it is porous enough to hold 30 to 35 per cent of liquid by volume, which may be anything from kerosene to "600 W" oil. The porosity does not, however, prevent the bearing from approaching the strength of a cast bronze bushing of equivalent dimensions, in addition to which it has both oil and graphite content.

The porosity of the bushing can easily be demonstrated by holding a finger over one end of the bushing, filling it with water, and then applying pressure to the water by pressing the thumb into the open end of the bushing. Water and oil will immediately come through the wall of the bushing. If the bushing is placed in a vise and squeezed, a thick coating of oil will rise on the surface, which demonstrates the point that if the bearing is subjected to a load or pressure, lubrication is immediately supplied to relieve friction and carry off heat. At the same time the bushing will withstand a unit pressure of possibly 4,000 to 6,000 pounds before it will reach the point of failure. And 4,000 or 6,000 pounds is considerably more pressure than a bushing will have to withstand in use in the average piece of machinery. The manner in which the Oilite bushing responds to the application of heat can be demonstrated by holding a lighted match against the bushing. A film of oil will immediately appear on the surface.

Insofar as the actual strength is concerned, an Oilite bearing is inferior in strength to a cast bronze bearing—but that fact seems to be beside the point. For instance, the propeller shaft of a loaded automobile truck running in second gear carries a load which, in the form of bearing pressure, amounts to 4,000 pounds per square inch. The limit of a cast bronze bushing is 800 pounds, which is insufficient; consequently it has been standard practice to use hardened and ground steel bearings on the propeller shaft. However, the steel bearings have never been satisfactory, so an experimental break-down test was made recently in order to obtain a comparison between steel bearings and Oilite bearings. The steel bearings failed in from 30 minutes to eight hours. When Oilite was applied to this job, the Oilite bearings stood up for 150 hours under exactly the same conditions. Since that test two manufacturers of propeller shafts have standardized 100 per cent on Oilite bushings, as have also a large bus company and a well-known truck manufacturer.

The amount of shock that can be survived by a bushing is another important point. In order to determine the shock-resistant properties of Oilite bearings, the engineers set up a steering gear and arranged an eccentric weight so that an impact load could be applied to the cross shaft. A total load of 25,100 pounds was applied at a speed of 800 r. p. m. on a bearing area of less than four inches. This load was sufficient to break the housing within a short time. In a duplicate test the housing was strength-

VERSATILITY



SIMPLE in design, universal in adaptability to the demands of the tool room, the application of power feed makes this LeBlond Universal Grinder an ideal machine for the shop, and for all classes of tool room grinding.

It has motor drive to wheel head, work head and power feed. This power feed unit is particularly advantageous for internal and cylindrical grinding and small manufacturing jobs. Also built for belt drive. Plain or universal equipment supplied.

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For 25 cents we will send you a 70-page illustrated manual of lathe operation, "Running a Regal."

Mail this ad for descriptive literature on the new LeBlond line of Regal Lathes. A geared head lathe made in five sizes, 10" to 18", and priced from $276.00 to $947.00, F. O. B. factory.

ened, and this time the worm and segment gear failed. In no case did the shaft or bushings show any wear or scores.

The Oilite bearing has demonstrated its efficiency so well that it has been adopted as standard for use on Chrysler automobiles for water pump bushings, spring shackle bushings, steering gear bushings, propeller shaft bushings, and so on. A year ago the Oilite bushing was used in three places in Chrysler eight-cylinder cars; at the present time there are 80 places in the Chrysler car where this bushing is used, and it is rapidly being adapted to other uses.

In tests that have been made with Oilite bearings in which the bearings were run in cars that traveled from 30,000 to 50,000 miles, it was found that the bearing surface had taken on a highly lustrous or mirror-like finish, but that no wear was perceptible. In fact, strange as it may seem, the best way to size the bearing is by the use of a burnishing tool, as reaming has a tendency to close the fine pores in the metal. Machining of any kind—turning, boring, or reaming—closes some of the pores and interferes with the porosity of the metal.

One of the newest applications of Oilite is in the form of a disc that is being inserted between the leaves of automobile springs to serve as a permanent source of oil for the bearing surfaces of the spring leaves. The discs that have been made thus far are 1¾ in. in diameter by $\frac{1}{16}$ in. thick, with a boss in the center of one side, ½ in. in diameter by $\frac{3}{16}$ in. high. A hole is punched near the end of each spring-leaf to receive the boss on the disc and thus keep the disc in place. As the discs keep the leaves spread slightly, the springs are covered in order to prevent dirt from entering. The inserts are now in use on Chrysler cars and exhaustive tests have shown that the inserts lubricate the springs for the life of the car. The Amplex Manufacturing Company seems to have been successful in developing a mechanical accessory for which there has existed a great need.

Series of Technical Monographs on Industrial Lubricants

Beginning with this month, the Standard Oil Company of Indiana, 920 S. Michigan Ave., Chicago, Ill., Technical Division, will publish each month a technical monograph on the lubrication of some type of mechanical equipment. This service has been conceived in response to the many requests that have been received from plant executives for specific authoritative information as to the proper lubrication of various types of machinery.

The plan is to cover the whole line of the more important industrial equipment, taking up one unit at a time and making the lubrication discussion simple, brief, and informative. No recommendations for any particular brands of lubricants will be made; the series is to be confined to unbiased technical information. The monographs will be sent without charge to plant executives who address this firm as above, using their firm letterhead.

"Ludlum Steel Blue Sheet"

The Ludlum Steel Co., 458 Armstrong Street, Watervliet, N. Y., is now issuing "Blue Sheets" for engineers and mechanical executives. The information contained in the Blue Sheet is compiled by the research department of the company, and consists of data and reference material regarding steels and their properties as disclosed by actual tests. Each of the steels discussed is described in detail as to characteristics, and instructions are given regarding methods of hardening, tempering, annealing, forging, machining, and so on. Charts and figures obtained from physical tests are included, with figures on impact properties, tensile properties, and distortion properties. The hardening data discusses the fractures obtained by hardening at various temperatures, and gives the Brinell and Rockwell hardness numbers.

The sheet is 8½ x 11 in., perforated for binding. Blue Sheets will be sent to any mechanical executive or engineer who addresses his request as above.

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1. *Balanced Drive, at two points diametrically opposite*
2. *Perfect alignment, maintained by all moving parts rotating around a common axis*
3. *Automatic Oil Bath Lubrication*
4. *Controlled by rope, push button or outrig for every hoist*
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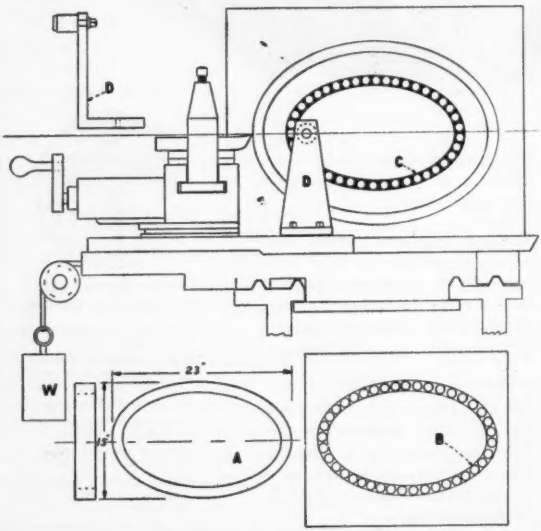
IDEAS FROM READERS

This department is a clearing house for ideas . . . If there is a "kink" or short cut in use in your shop, send in a description of it . . . We will pay $5 for each one published.

Quick Method of Machining Elliptical Rings

By CHARLES KUGLER

A SMALL tool and jobbing shop took a job which involved the making of an elliptical punch and die. In order to get the job out within the time specified and also to reduce the cost as much as possible, the elliptical contours on the punch and die were machined by the method described here. The size of the ellipse is indicated at **A**.



Drawing illustrating quick method of making an elliptical punch and die.

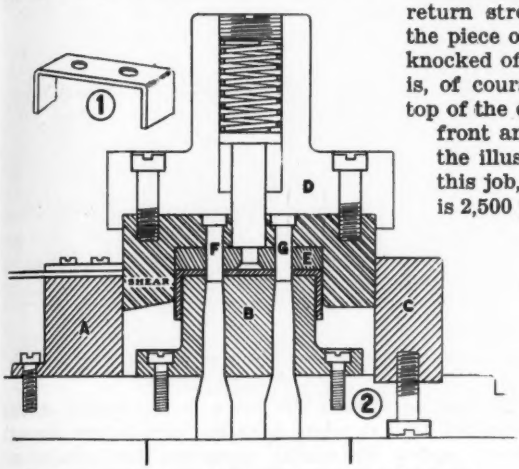
A master ellipse or cam was made by laying out the ellipse on the plate **B**, then a series of ½-in. holes were drilled as closely together as possible, following the outline of the ellipse, and ½-in. pins were driven into the holes. Two lengths of ribbon steel were drawn taut around the outside and inside of these pins and molten babbitt metal was poured in. When the metal was cold, the ribbons of steel were removed, leaving a master as shown at **C**. The piece to be machined was fastened to the plate **B** with screws, and then the plates were clamped to the faceplate of a large lathe.

A bracket **D**, carrying a roller, was bolted to the cross slide so that the roller could engage the inside of the master **C**, then the cross slide screw was disengaged and a weight **W** was attached to the cross slide to keep the roller in contact with the master cam. Two rings were made, each being faced on both sides. One ring was machined on the outside and the other on the inside, so that one could be used as the punch and the other as the die. Although the ellipse was not perfect, it was good enough and the job was finished on time. The stampings made by the use of the tools were used in the manufacture of trays.

A Good Multiple-Operation Tool

By CHARLES H. WILLEY

SIMPLE dies and punches that perform multiple operations are nearly always designed with but one thought in mind—to produce an accurate job and at the same time keep costs to the minimum, both as regards the production operation and the tools with which the operation is performed. The drawing shown here is a good example of economical design.



Tools for cutting, punching, and forming back straps.

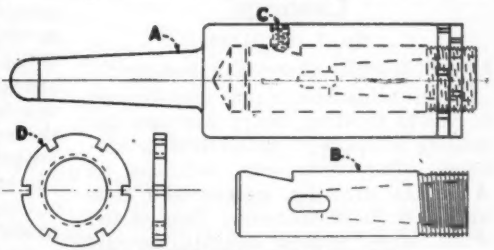
The tools are used in the manufacture of the back straps by which dash ammeters are held in place. A strap is shown in Fig. 1. The stock is 3/32 x ⅝-in. cold rolled steel, and a complete strap is produced at each stroke of the press. The stock is fed through a covered guide **A**, Fig. 2, and across the lower die **B** until it is stopped by the stop-block **C**. The press is then tripped, the upper punch **D** descending and shearing the stock.

At this point the stripper **E** contacts with the stock and holds it in place on the face of the die **B** while the forming operation is in process. Having sheared and formed the piece, the punch continues downward until the punches **F** and **G** have pierced the work and as the punch raises on the return stroke, the stripper **E** leaves the piece on the lower die, where it is knocked off into the chute. The stock is, of course, guided on the face and top of the die **B** by guide strips on the front and back edges, not shown in the illustration. The production on this job, hand feeding and tripping, is 2,500 pieces per hour.

Adjustable Extension Collet

By ERNEST FOLDVARY

THE drawing shows the design of an extension collet which can be adjusted for accuracy in drilling to a pre-determined depth, or which can be adjusted to bring all spotfacing tools in a multiple head to a uniform distance from the work or table of the machine. This tool makes it possible for the operator to use drills or reamers of slightly varying lengths, which is a condition that is impossible to avoid as the tools are reground and at the same time keep the points or cutting edges of the tools even.



Design of Adjustable Extension Collet.

The sleeve **A** is made with a straight, smooth hole to receive the collet **B**, and is drilled and tapped for the standard setscrew **C**. A slot, tapering from zero at one end to perhaps ⅛-in. at the other, is milled in the side of the collet to form a seat for the setscrew. The lower end of the collet **B** is threaded on the outside for the two lock-collars **D**, each of which is slotted at evenly-spaced intervals on the periphery for a spanner wrench.

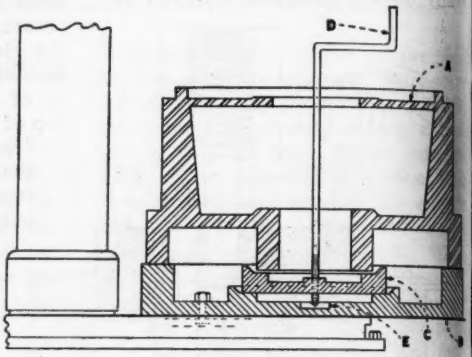
The lock-collars determine and maintain the depth to which the collet enters the sleeve, providing an adjustment of perhaps ⅜ to ½ in., depending upon the amount of thread on the collet. With the collars properly adjusted and the collet in the sleeve, the setscrew **C** is screwed down tight to hold the collet in place. The dimensions of the parts can be varied to suit, working from the size of taper desired on the sleeve and the size of the taper on the tools to be used.

Turn Table Fixture for Handling Heavy Castings

By J. C. HART

THE drawing shows the design of a turn table fixture that was devised to aid in locating heavy castings for drilling with a 4-ft. radial drilling machine. The work-piece, indicated as **A** on the drawing, weighs four tons and is 6 ft. in diameter; thus if the work were located directly on the base-plate of the machine, it would extend beyond the base-plate and jacks would have to be used to support it. In such a case the crane would be required to lift the work-piece each time it was shifted, and it would have to be leveled after each move and before drilling.

The fixture consists of the base casting **B**, the saddle casting **C**, and the handle **D**. The work is supported on the base casting **B**, which is bolted to the machine base-plate. Underneath the work is the saddle casting **C**, which is drilled and tapped through the center to receive the threaded end of the handle **D**. The handle is made from 1-in. stock and the thread is standard. A hardened steel bearing **E** was set into the base casting to receive the bottom end of the handle.



Drawing showing design of turn table fixture with work in place.

When the handle **D** is turned, the saddle **C** is raised and the work is lifted until it clears the base casting **B**, then it revolves with the handle. When it is in the desired position, the operator holds the work steady with one hand and revolves the handle in the reverse direction with the other, lowering the work until it rests on the base again. The entire operation of moving and locating the work takes much less time than would be required if the crane were used.

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BY WAY OF EVIDENCE—
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The job is being done most satisfactorily with the improved Carborundum Brand Redmanol Roll Grinding Wheel removing, ½" stock and holding to within a tolerance of .001 inch.

This improved wheel not only cuts fast and clean, giving a finish that meets all requirements, but on this Cincinnati Grinder, aided by the fine performance of the wheel, the grinding time has been reduced to 10 hours as against 25 hours on the old set-up.

Speed of cut, economical wheel life, perfection of finish—plus greater production—these are again evidenced through the use of the improved

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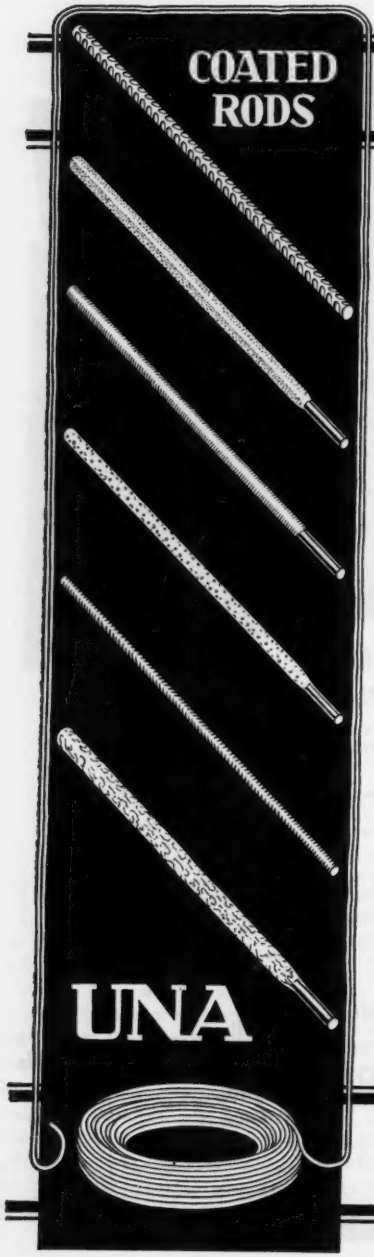

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Real worthwhile coated welding rods are not just a lot of fence wire cut up and covered with any old paste. The determination of the composition of the base steel rod as well as the composition of the coating for each particular base require expert laboratory tests and experiments. UNA Welding, Inc., has for years, worked on this assumption.

Given the complete data of your welding problems, UNA can furnish the correct welding rod and tell you how to use it. We will design and build the necessary fixtures for use in Automatic Welding and furnish the proper Automatic Welding head.

Choose your welding rod on the basis of "Cost per pound of deposited metal" and by the quality of the finished weld, and you will choose UNA COATED RODS.

UNA WELDING, INC.
UNDER MANAGEMENT OF
THE CLARK CONTROLLER CO.
CLEVELAND, OHIO

Over the Editor's Desk

ON another page in this magazine will be found a description of a new lathe that has been built in an effort to discover and utilize the ultimate possibilities of carbide tools. It is interesting to note that not the least of the problems involved in the design and construction of the machine is the removal of the chips. Demonstration cuts produced chips at a rate that would have kept one man with the usual shovel and wheelbarrow more than busy, consequently a more efficient means of removing the chips was necessary. Thus a mechanical chip-conveying system was developed, and we may expect to find, in the future, chip conveying systems quite as elaborate as those now in use for handling parts in production. The carbides are apparently exerting an influence which may ultimately extend to the design of the buildings in which they are to be used.

DR. J. A. ESTEY of Purdue University says (via *The Purdue Engineer*) that the training of the future engineer will include a course in economics. He says that although the majestic march of the machine makes the life of the engineer just one triumph after another, machines are not an end in themselves. They are the means to the end of satisfying our economic wants and to aid in the successful operation of our economic system.

Thus far the engineer has devoted the major part of his talents to production. Now he is learning that he cannot live by production alone; he will have to study market possibilities and what the advertising man calls "consumer acceptance."

Dr. Estey says, "We are going to have, some day, a planned industrial economy. It is not conceivable that an intelligent community will continue to put up with the grievous fluctuation of income brought about by the imperfect adaptability of the industrial system as it now works. . . . And in this sort of work engineers are bound to take a large and leading part. . . . In the new economic world that we all see is coming, engineers and economists will join forces so that from this combination of technical and economic wisdom there may even yet be achieved a society wherein poverty and unemployment will at least have disappeared."

Thus Dr. Estey has given voice to an opinion that is general among those who are gifted with the ability to anticipate the forces of evolution and development, that this country is on the verge of a new economic set-up.

It is this ability to move along with the stream of progress that makes ours the greatest nation on earth—the ability to float along, like a craft on the stream, from one peaceful pool to another. When one pool becomes turbulent, we move on to the next. All of which is much better than the condition of a people who clung so long to an antiquated and stagnant r e g i m e that when they finally wrenched themselves free, the force applied was so great that they were thrown into the rapids, where the danger of a crash is ever present and the future—over the falls to chaos or into a harbor of peace—is uncertain.

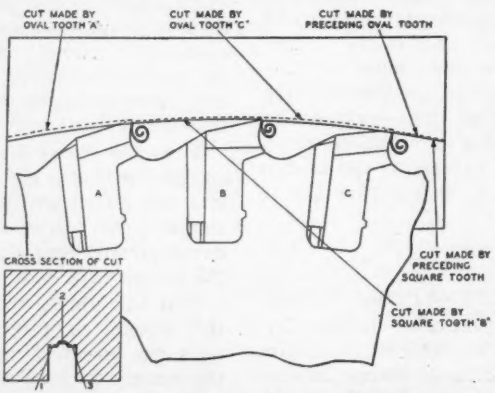
Metal Cutting Methods

By SIMONDS SAW AND STEEL CO.

Curved Gullet Saws Speed Up Metal Cutting Jobs

CURVED GULLETS in Inserted Tooth Metal Saws are a comparatively new departure in the metal working field, but the success with which they have met places the achievement foremost in this particular division of saw making.

Engineers of the Simonds Saw and Steel Co., Fitchburg, Mass., who are responsible for this development, when asked to explain the principle on which the new curved gullet saws and scientific designed teeth operate, offered the following explanation and diagram:



The sketch herewith illustrates the action of the saw, showing oval and square teeth. It will be noticed that the oval teeth are slightly longer than the square teeth and cut a groove one-third the width of the kerf. The square tooth which follows into the cut removes the other two-thirds—one-third on each side of the central cut. The groove cut by the oval teeth is deep enough so that the chips cut by the square teeth are in two pieces and easily clear the cutting corners of the square teeth by working toward the center instead of rubbing and sticking on the sides of the teeth as is the case of a saw using all square teeth. A curved gullet saw will cut easier, use less power and stay sharp longer.

Notice the circular gullet from the cutting-edge of the tooth straight down 5/32 inches on the line pitched 12 degrees back of the center. At this point the gullet begins to curve very gradually for a short distance. The chip follows this curve easily and naturally, carrying it out of the gullet without sticking or filling or carrying around into the cut again. This carrying around of chips causes more trouble from broken teeth and saws than all other difficulties en-

SIMONDS

RED STREAK

HIGH SPEED STEEL
HACK SAW BLADES

The distinctive Hack Saws with the brilliant Red Back Edge—the blades that cut 10 times more tough metal and outlast dozens of the other kinds

countered in the usual metal cutting job.

Inserted Tooth Metal Saws are made in five sizes, for cutting the large, heavy-duty work to the smallest lighter material where economy of metal is particularly desired.

We suggest that anyone wanting information relative saws of this type write direct to Metal Saw Department, Simonds Saw and Steel Co., Fitchburg, Mass.

When Hack Sawing Watch The Pressure

THERE are four important things an operator should observe when cutting metal with a Hack Saw. First —Do not apply too heavy pressure when starting the cut or when cutting thin metal. Second — Cut evenly to avoid cramping or binding. Third—Be sure the material being cut is held securely, and fourth, be sure to strain the blade as tightly as possible in the frame or machine.

SIMONDS Metal Cutting Bands

IT IS more economical to use Simonds Hard - Edge Metal Band Saw Blades because they hold their edge longer, do not break, and they render service when other bands have been discarded. Write Simonds for up-to-date metal cutting information.

SIMONDS
Saw and Steel Co.
"The Saw Makers"
Fitchburg Mass.

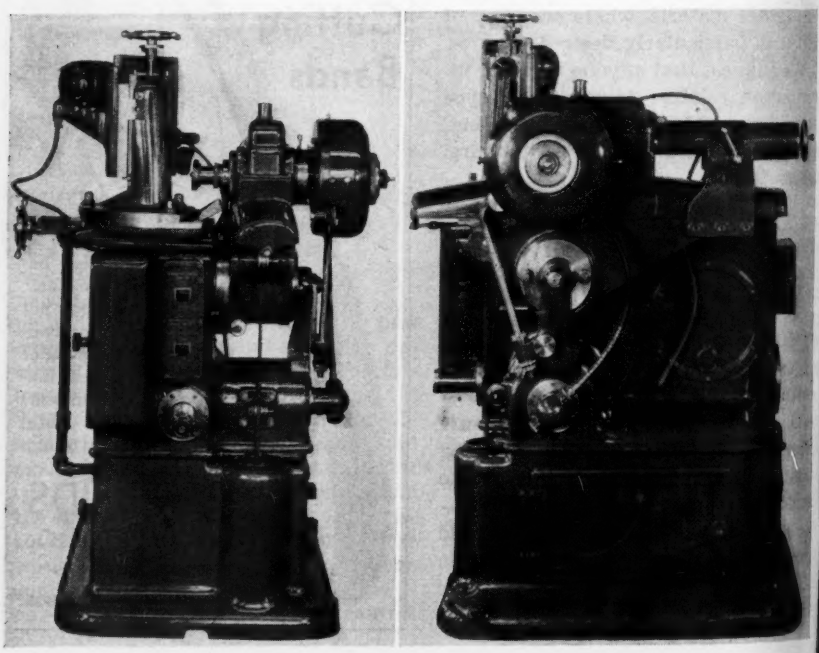
NEW SHOP EQUIPMENT

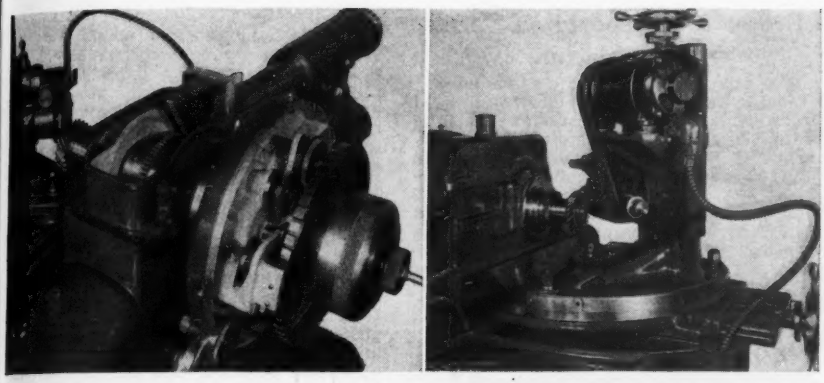
"National-Cleveland" Resharpening Machine for Flat-Face Helical Gear Shaper Cutters

Helical gear shaper cutters of the flat-face or flat-top type can now be sharpened by the use of an involute helicoid grinding machine that has been developed by The National Tool Company, Cleveland, Ohio. The machine operates on the describing-generating principle of action, and is so designed that the cutters can be resharpened to produce gears of true involute form. In order to obtain sharper cutting edges for more effective cutting action, it has been common practice to grind back the end cutting faces of the cutter to form a plane normal to the cutting teeth at the pitch circle and at an acute angle with respect to the axis to give the cutting faces a hook. It is said, however, that this practice results in a cutting edge that does not conform exactly to the involute curve.

By using the machine shown in the illustration, cutting edges are provided in the plane of the revolution of the cutter by intersecting the involute helicoid side faces of the teeth with an involute helicoid of the opposite hand. In order to provide cutting edges at opposite sides of the teeth and of the sharpness desirable for efficient generating cutting action, the end faces of the teeth are ground back along the cutting edge, to provide involute helicoid surfaces inter-

Front and Side Views of "National-Cleveland" Resharpening Machine for Flat-Face Helical Gear Shaper Cutters.





(Left)—Detachable Index Plate and Removable Rack Wedge that Reciprocates the Work-Spindle. (Right)—Position of Grinding Wheel Head for Resharpening Left-Hand Cutters.

secting the side faces of the teeth at the selected angle, which may have, in addition, any angle of undercut, rake, or hook desired. Along the obtuse end face of each tooth, adjacent to the intersection of the side face with the end face, is ground a curved groove of preferably V-shaped cross-section. Any angle of undercut desired may be obtained. Before resharpening the cutters, the end face should be ground flat on a circular surface grinder.

During the resharpening generating action, there is a relative movement of the grinding wheel and cutter occasioned by combined rotative and translative movements. The diameter of the cylindrical grinding wheel is preferably small, and will be such that the elliptical section through the grinding wheel, in the plane of the cutting edge being generated, will have a radius of curvature at its vertex not greater than the radius of curvature of the involute at the root line of the tooth, so that during the entire resharpening generating action, the grinding wheel remains tangent to the involute curve of the cutting edge.

In setting up the machine, the axis of the wheel is spaced above the axis of the cutter by raising the grinding wheel slide and determining its height by means of the scale and vernier. The grinding wheel head is then swiveled directly to the helix angle of the cutter, the reading being taken from the graduated base and the co-acting vernier. For undercutting, the angular setting of the wheel may be decreased for the obtuse side and increased for the acute side, for right and left-hand cutters. A motor is provided on the grinding-wheel slide, and a reversing switch is also provided.

A rack wedge is required for each base circle diameter, without regard as to whether the cutter is right or left-hand or with regard to the pressure angle, number of teeth or other tooth elements. This rack wedge is inserted and removed without the use of tools. One rack wedge is furnished with each machine. The index plate is detachable and has a number of notches corresponding to the number of teeth in the cutter, or it may be in multiples thereof.

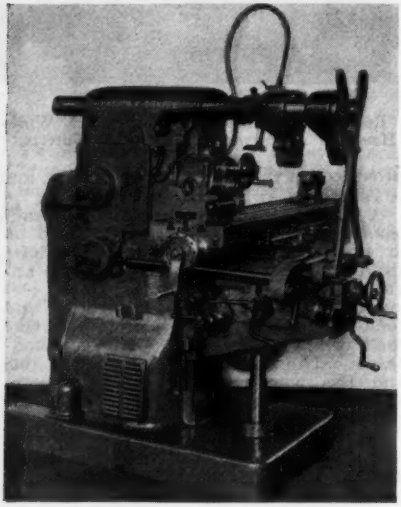
The motor in the base causes the connecting rod to oscillate the index head. The rack wedge meshing with the gear on the work spindle causes the work spindle slide to reciprocate. At the outer position of the slide, the cutter indexes. This cycle is repeated until all teeth have been resharpened.

A handwheel at the outer end of the index head causes the work to rotate in the same direction so as to position it with respect to the grinding wheel. The slide may be moved forward or backward to bring the front edge of the grinding wheel above the axis of the work. This position is noted on the scale mounted on the front of the slide and slide base.

The machine indexes 35 times per min., and the average time per cutter is 15 min., bench to bench. The machine requires a ½ h. p. motor for the grinding wheel spindle and a ¾ h. p. motor for operating the machine. Motors are not furnished, but starting switches are supplied. Weight of machine, 3,000 lb. Base, 32 x 43 inches.

Brown & Sharpe High Speed Milling Machines

Brown & Sharpe Mfg. Co., Providence, R. I., is introducing a line of high speed milling machines for economical milling with all types of cutters on a great variety of materials. These machines, plain and universal, of the column and knee type, are manufactured in both No. 2 and 3 sizes. The machines are designed to afford three advantages; high milling speeds, reduced setting up time, and reduction of time lost between cuts. The high speeds make possible the use of tungsten and tantalum carbide tools. Setting-up time is reduced through the use of complete dual front and rear controls. Power fast travel in all directions reduces non-productive time to the minimum.



B & S No. 3A High Speed Universal Milling Machine.

One of the features of construction of the machines is that the motor runs only when the machine is actually cutting. No clutch is used; the starting lever throws the switch controlling the motor, and in the down position also operates a powerful spindle brake. All controls are available at both front and rear operating positions. The power feed cannot be engaged while using hand adjustments. The longitudinal hand control gives the choice of long leverage by using the crank or "rimming" the handwheel for delicate adjustments.

Thirty-two changes of spindle speeds are provided, ranging from 20 to 1,200 r. p. m., and a wide range of back gear speeds is available, 16 changes to 288 r. p. m. The speed series desired is controlled through conveniently-placed levers. The speed for which the machine is set is shown on a direct-reading dial. All gears are ground, assuring the smoothest possible drive.

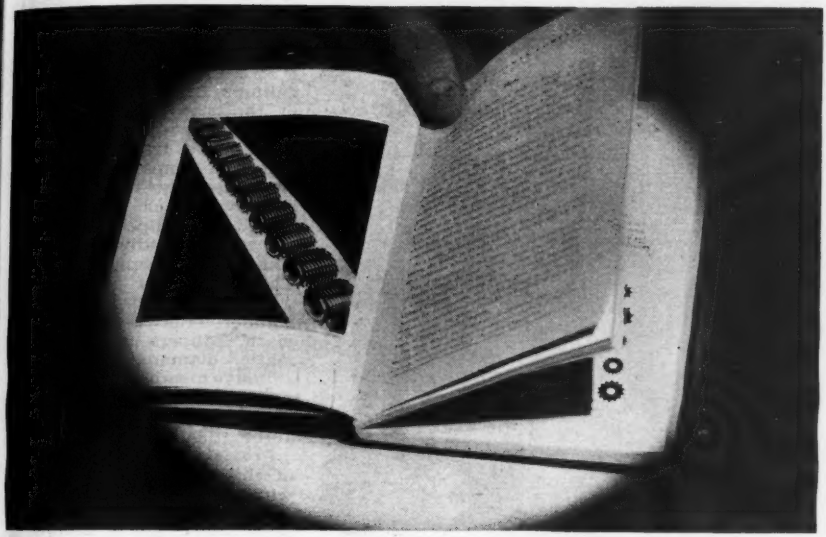
Thirty-two cutting feeds, from ⅛ in. to 62 in. per minute, provide for economy in the cutting of both ferrous and non-ferrous metals. All changes in the power feed of the table are made by rotating either of the feed change levers which are conveniently located at front or rear operating position, and the rate of longitudinal feed engaged is shown on the direct reading dial. The dial has large figures and may be seen from either operating position. Transverse and vertical feeds are 4/10 of the feed shown on the dial.

The driving motor is completely enclosed in a compartment in the lower part of the column, and all parts of the motor, chain and sprockets are easily accessible. All control mechanism and wiring are completely enclosed. The machine table is especially designed to handle large quantities of cutter coolant. In addition to the above features, the machines have the usual Brown & Sharpe features, including double overarm construction, standardized spindle end, one-piece elevating screw, anti-friction bearings in all main mechanisms, and—on the universal machines—universal spiral index centers.

Gardner Duplex Vertical Surface Grinder

A vertical surface grinding machine with two spindles, arranged so that work may be rough and finish ground at a single pass, is now being built by Gardner Machine Company, Beloit, Wis. The major portion of the stock on the work is removed by the roughing wheel and the piece is finished by the finishing wheel. Increased production and greater accuracy are claimed for this design.

The machine consists primarily of a heavy base with a horizontal table supported on flat, circular ways. This construction permits a stationary shaft to be built up from the base, through the center of the table, on which fixture operating mechanisms may be mounted. The table is driven by a large spur gear and pinion, mounted close to the peri-



54 PAGES ON HOBS IN CATALOG H

There are 54 pages of information on Hobs in Barber-Colman Catalog H. How B-C Hobs are made, sizes and kinds carried in stock, limits, useful tables, forms which have been hobbed and how to order B-C hobs are some of the subjects covered. Additional pages describe our Hob Sharpening Machines and Hobbing Machines. • Buy Barber-Colman Hobs for any make of hobbing machine, for any work that can be hobbed. Refer special hob requirements to our Engineering Department. The experience gained in 20 years of manufacturing hobs and solving hobbing problems is at your service—profit by it *today*. • Catalog H mailed promptly on request

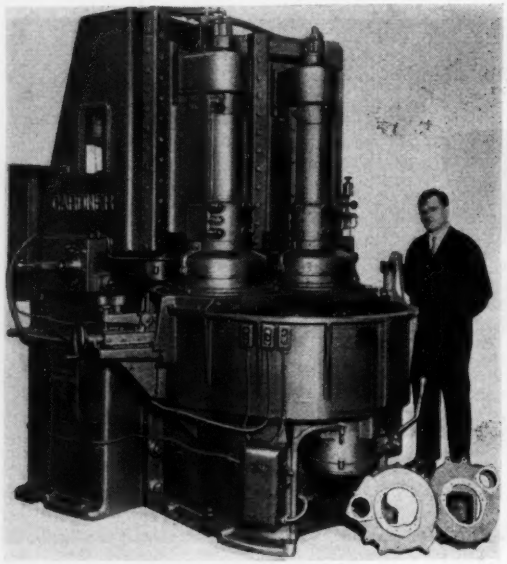
BARBER B-C COLMAN

PRODUCTS

MILLING CUTTERS, HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant ROCKFORD, ILLINOIS, U S A



Gardner Duplex Vertical Surface Grinder.

phery and thus applying the drive practically beneath the work. The use of a revolving table and central shaft makes possible the use of a sub-table, or fixture body, in which all of the fixture-operating mechanism is totally enclosed in an oil-tight and water-tight compartment. The fixture body can be removed from the table when not required.

The vertical columns on which the spindles are mounted have three-point suspension support and either can be adjusted from a perfect right angle to a degree which permits slight tilting, thereby obtaining two cuts on the same wheel in one pass. The slight concave in the surface is removed by the finishing wheel. Each column is self-contained and is equipped with automatic as well as hand vertical adjustment. Suitable hinged brackets inside each column provide for mounting any "Nema" frame motor within the capacity of the grinder, and these motor brackets are adjustable for correct belt tension.

Directly beneath each wheel spindle is attached a dresser which may be used without disturbing any fixture set-up or spindle adjustment. An automatic dresser may be mounted on the fixture body, when required, and controlled by mechanism enclosed within this body.

Two automatic air-operated calipers, mounted on the side of the base, control the accuracy of the grinding. As the work passes from the roughing wheel it comes into contact with the first caliper. If insufficient stock has been removed, the caliper will function to automatically lower the spindle the required amount. The setting of the finishing wheel is controlled in the same manner. Between these automatic calipers and the automatic diamond dresser, the abrasive members require practically no attention on the part of the operator and accuracy is automatically maintained.

Provision is made in the rear of the base for a water tank, with a centrifugal pump. All moving parts, including the table ways, are submerged in oil at all times. The spindles are grease-lubricated. All electrical equipment is controlled through push buttons and remote control switches. The machine is available in several sizes.

Milwaukee No. 3 and 4 Knee-Type Milling Machines

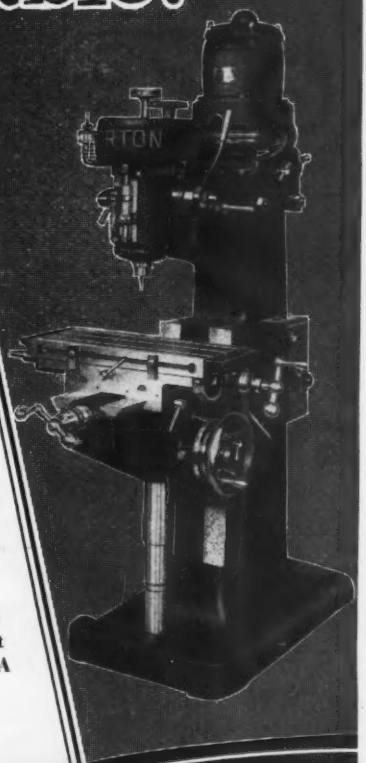
Kearney & Trecker Corporation, Milwaukee, Wis., has added two new sizes —No. 3 and 4—to its line of knee-type milling machines. The new style machines are now available in four sizes, each of which is built in the universal, plain, and manufacturing horizontal types, and in the plain and manufacturing sliding head vertical types.

Outstanding features include a greatly increased range of spindle speeds from 12 to 1,200 r. p. m., feeds from ¼ in. to 60 in. per min., a new center-bearing spindle with worm drive, sponson-type knee, and a multiple V-belt drive with motor set at right angles to the spindle.

The 100 to 1 speed range permits surface speeds in either direction as low as 50 ft. per min. for a 12½-in. diameter cutter, and as high as 100 ft. per min. with a ¼-in. cutter. This broad range makes possible better performance with high speed steel cutters, as well as permitting full use of the advantages of

"Indispensable!"

says Sperry Gyroscope Tool Room Foreman



For small, accurate, unusual jobs . . . . small radial milling, drilling and boring, narrow slide slots, and laying out jobs on small fixtures and jigs, the *Sperry Gyroscope Company* uses Gorton 8-D Milling Machine.

With three of these inexpensive machines now in operation, the foreman of Sperry's Special Tool Department reports that work is being done 25% faster, on the average, than when larger, more costly machines were used. *"Our Gorton Vertical Millers"*, he reports, *"are very sensitive and most accurate. They are essential for our work — indispensable!"*

Gorton users can tell you that this specialized machine is ideal for light, high speed milling. *"Convenient — very good indeed"*, *reports the* Gaynor Electric Company. *"Very well pleased with our several 8-D Vertical Milling Machines"*, says the Allied Die Casting Company.

Remember the 8-D costs less than half as much as the general purpose machines it replaces . . . yet handles many types of work faster and better. A machine you'll want to know more about!

Write for Bulletin 1187.

George Gorton Machine Co.
1101 13th St., Racine, Wis.

GORTON 8-D
VERTICAL MILLING & ROUTING MACHINE

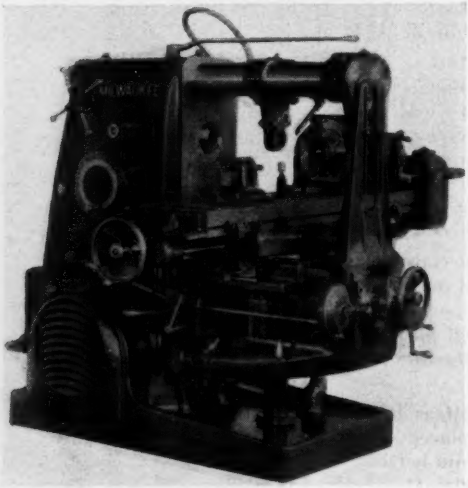
TRADE MARK
GORTON
RACINE, WIS., U.S.A.

tungsten carbide and tantalum carbide.

Twenty-seven speed changes are provided in geometrical progression, obtainable by a single lever in combination with a large direct-reading dial. The spindle is mounted on three bearings, equally spaced, which greatly enhances the general stiffness. The front and center bearings are arranged to take both radial and thrust loads. The rear bearing is of the straight roller type and is arranged to take the radial load only.

Feeds are available from ¼ in. to 60 in. per min., 27 changes being available by means of a lever and dial located on the front of the knee. The knee of the machine is H-type box section, with enclosed walls and heavy projections at the bottom of each side in the form of sponsons. The bearing of the knee on the column face is very long, extending to the top of the saddle. The knee, being a solid box, has its own oil pump, providing flood lubrication for all bearings and gears within and making it possible for the elevating screw to run in a bath of oil.

The motor is mounted at right angles to the spindle, which not only makes the motor accessible from either end, but also greatly strengthens the column. Multiple V-belts connect the motor to the driving pulley. The pulley is of fan construction to draw air in through the louvres in the door and past the motor.



Milwaukee No. 3 and 4 Knee-Type Milling Machine.

The double overarms on the No. 3 and 4 machines are 5¾ in. in diameter, providing rigid support to the arbor. The machines are equipped with two arbor supports, the outer one solid, and the center one split in halves. Each half is bored to fit one of the overarms and the halves are locked together by a long bolt. When it is desired to remove the arbor, each half of the support is swung around its overarm and the arbor is removed intact, thus preserving the original cutter spacing.

Power rapid traverse in six directions is provided. Operating handles are located in the most natural position for the operator, with identical sets at front and rear of the machine. Automatic flood lubrication is supplied for all gears, shafts, and internal mechanism.

The plain machines are similar to the universal excepting that the table does not travel. The manufacturing type is a modified form of the plain machine, with speed and feed changes obtainable through pick-off gears. The feed range of the manufacturing machine has 24 changes, from ¼ in. to 60 in. per minute.

The sliding head vertical machine is furnished either as a plain machine with quick change mechanism or as a manufacturing machine with pick-off gears. The head has 8 in. of vertical travel, and can be furnished with power feed and rapid traverse with a range of 27 feeds from ⅛ in. to 30 in. per min. The rapid traverse is 75 in. per min.

The No. 3 and 4 universal machines are equipped with 14-in. swing hypoid bevel gear dividing head, designed to give leads for cutting threads as fine as 38 threads per in. as well as up to 2,900 in. in one turn. Three sets of reversible worms and worm wheels are included, by means of which 40,362 different leads may be obtained.

"Landmaco" 1 1/4-In. Pipe and Nipple Threading Machine

The Landis Machine Company, Inc., Waynesboro, Pa., announces the 1¼-in. "Landmaco" Pipe and Nipple Threading Machine shown in the illustration. This machine is designed to meet the demands of nipple manufacturers for a modern threading machine with exceptional wearing qualities and a capacity

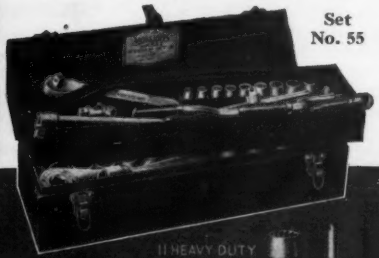
This WILLIAMS' SOCKET SET No. 55 *is designed for* MASTER MECHANICS

Every millwright will find this special combination set of "Standard" and "Heavy Duty" SUPER-SOCKETS ideal in industrial plants for the set-up and maintenance of all machinery.

Twenty-one Twin-Hex Sockets for all U. S. Std. Nuts, ¼ to 1", and Cap Screws ¼ to 1⅜", with two complete lines of 14 Handles and Parts — Standard pattern for Sockets up to ⅞" Hex and Heavy Duty pattern for the larger sizes. The great variety of handle styles provides all desirable Socket Wrench combinations.

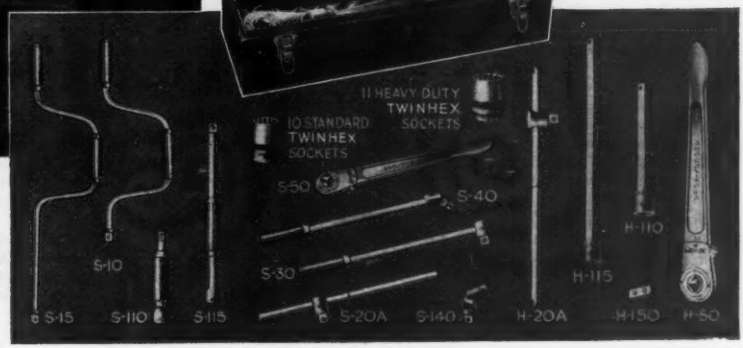
Ask your mill supply dealer for Williams' "Supersocket" Set No. 55. The list price, $75.90, is subject to a liberal discount.

J. H. WILLIAMS & CO.
"The Wrench People"
75 SPRING STREET NEW YORK



Set No. 55

Buy from your Distributor



Western Warehouse Sales Office
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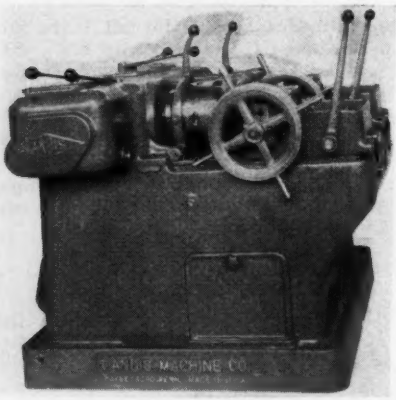
WILLIAMS
SUPERIOR DROP-FORGED TOOLS
"SUPERSOCKET" WRENCHES

Works
BUFFALO, N. Y.

for producing nipples of greater accuracy at a lower cost.

The machine is made in the single and double head models and is equipped with either externally or internally tripped "Lanco" pipe and nipple threading heads. Its range is ⅛ in. to 1¼ in. with the externally tripped head and ¼ in. to 1¼ in. with the internally tripped type.

A single pulley drive with a friction clutch control delivers power to the machine. The clutch is mounted on the



"Landmaco" 1¼-In. Pipe and Nipple Threading Machine.

outer end of the drive shaft where it is accessible for the ordinary maintenance adjustments. The machine can be motorized at any time by mounting a suitable motor in the motor compartment in the base and connecting it to the drive shaft with a silent chain.

The gear box is of the selective type with eight speeds. It is built into the headstock and is fitted throughout with anti-friction bearings. Gears are made of hardened and burnished chrome nickel steel and are mounted on heat treated alloy steel shafts. All bearings and gears are lubricated by a flood system of lubrication. The spindle is driven by spiral bevel gears. The bearings at the die head end are oversize, preloaded, anti-friction bearings, providing a permanent thrust load and eliminating the end play which might otherwise develop.

The die head is located close to the front spindle bearing, reducing the overhang to a minimum. It may be opened and closed either automatically or by hand. The automatic opening mechanism operates through a trip rod and yoke with the externally tripped die head and through the reaming attachment with the internally tripped type.

The carriage is gibbed to the bed and is operated by a lever which can be located on either the right or left hand side of the carriage. The guides are protected by guards and wipers. The guards are attached to the front of the carriage and the wipers are located at the rear end of the carriage.

The vise has both horizontal sidewise and vertical adjustments, which make possible an extremely accurate alignment between the die head and the work. The pump is of the low pressure gear type. It is built into the bed and can be removed for inspection without disconnecting any piping.

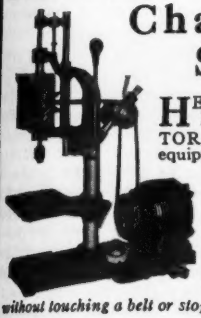
The bed is made of semi-steel and is cast in one piece. It is reinforced by an inner wall and forms a rigid support for the carriage and headstock. Large drains below the guides and also at the base of the bed return the cutting coolant overflow to the reservoir.

"American" 22-In. 100 H. P. Super-Lathe

The entirely new conception of lathe design, construction, and capacity represented by the lathe shown in the illustration was inspired by the need of one of the country's largest electrical manufacturers for a super-powered, super-capacitied lathe for the primary purpose of determining the maximum metal cutting capacities of cemented carbide cutting tools. In order to establish the maximum possibilities of the new cutting tools in various kinds of metals, far more power input, a much wider speed range, and much greater rigidity than has hitherto been available in a lathe of comparable size were essential. Consequently long established principles of lathe design were ignored and a machine was produced in which the 100 h. p. input, range of 140 spindle speeds and weight of 40,000 lb. is comparable to the 15 h. p. input, 12 spindle speeds, and 8,000 lb. of the average lathe of comparable swing. The machine was built by the American Tool Works Co., Cincinnati, Ohio.

Perhaps the most radical departure from usual lathe design is in the head itself. Two separate and distinct speed ranges are provided; one, the high speed or direct range, furnishes 70 spindle speeds obtained entirely through the 100 h. p. motor which is mounted on a cast-

No Time Wasted Changing Speeds!



HERE is the New High Speed VICTOR SUPER-DRILL equipped with ball and thrust bearings throughout, also with the "Wonder Pulley"... an exclusive, patented feature which gives you five spindle speed changes *without touching a belt or stopping the machine.*

This feature alone pays for the VICTOR SUPER-DRILL in a very short time. It makes *versatility* the key-note of this drill. There are no belts to change... no time lost. The different types of drilling it can do are unlimited. Let us show you... write for an illustrated circular.

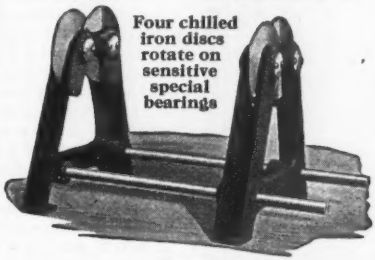
U.S. AUTOMATIC BOX MACH'RY CO.
459 Watertown Street
NEWTONVILLE, BOSTON, MASS.

Anderson Improved
Balancing Ways
No Leveling Required

A simple and excellent device for balancing, straightening and trueing.

They are made in the following sizes:

Swing	Greatest Distance Between Standards	Capacity in Lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000



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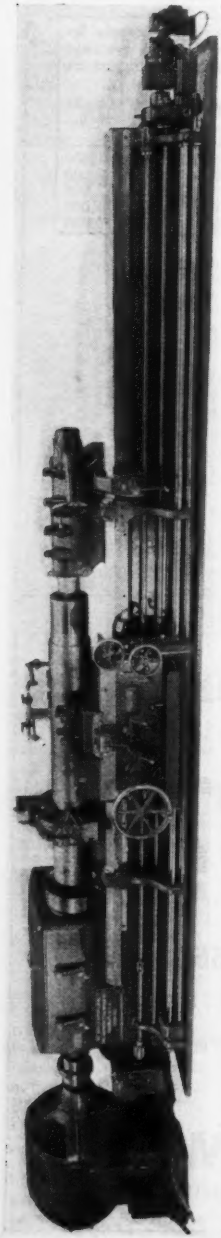
Mfd. By **Anderson Bros. Mfg. Co.**
1926 Kishwaukee Street, Rockford, Ill.

You CAN Get Work for Your Shop

HOW?

Just write for CIRCULAR 550.
That key number will tell us you want this question answered.

THE R. Y. FERNER COMPANY
1131 INVESTMENT BUILDING **WASHINGTON, D. C.**



"American" 22-In. 100 H.P. Super-Lathe (Patented).

iron pedestal at the end of the lathe and coupled directly to the lathe spindle by means of a flexible coupling. Control of this range of speeds is secured through the usual type of electrical apron control mechanism with the control handwheel located at the right-hand side of the apron, which starts and stops the motor and varies the electrical speeds. The second or back geared range provides the same number of speeds as the direct range and is secured thru four hardened and lapped helical gears, carried by the spindle and one auxiliary shaft.

The entire head mechanism, including the spindle, auxiliary shaft, gearing and bearings, is of massive proportions and made of the very finest materials in order to transmit with safety the full horsepower capacity of the 100 horsepower driving motor. The headstock lubricating system has been carefully developed and is completely automatic, consisting of a motor driven pump which forces the oil from the 16-gallon tank in the headstock bowl through an oil filter to the central distributing tank, from which the filtered oil is distributed through individual gravity tubes to all headstock bearings and through cascades to the gear teeth.

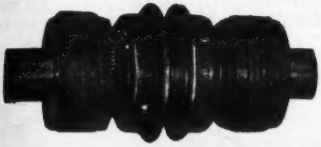
The bed is made with a closed top, providing a complete box section, thoroughly ribbed and greatly strengthened by numerous cross girths. The carriage guides, consisting of one very large 90-degree vee and one smaller one at the front and a flat 5 in. wide at the rear, are faced with hardened steel strips to minimize wear. The rear flat guideway is dropped considerably below the front vees, giving a very decided slope to the top surface of the bed for the purpose of rapid chip disposal.

The carriage, which is of massive construction, bears full length on both of the front vees with an auxiliary bearing for side thrust against the vertical wall of the inner vee, while the rear wing has a full length bearing on the wide, flat way at the rear. The carriage bridge is extended sufficiently at the rear to accommodate a rear tool rest if desired, in which event two separate cross feed screws, each with tempered bronze compensating nuts, are supplied — one for each rest.

The apron is of massive box construction, with heavy steel plates forming the front and rear walls. All gears in the apron mechanism are hardened and made from nickel steel forgings. All bearings are of the anti-friction type; the shafts are heat-treated steel, multiple splined for the mounting of the driving elements, and the entire mechanism is thoroughly and completely lubricated by means of the "one-shot" oiling system. The cross and longitudinal feeds are engaged and disengaged through positive saw tooth clutches actuated by drop handles and held in engagement by heavy compression springs. A motor-driven power rapid traverse mechanism is furnished as an integral part of the apron.

It is not difficult to visualize the grave danger to the operator from red-hot flying chips, where high speed cutting such as this lathe is designed for is done, without some means for breaking up and controlling the chip as it comes from the tool. For this purpose a chip-breaker and controller has been developed, which not only breaks up the chip into small sections, but deflects it as it breaks from the bar into the chip con-

INVESTIGATE



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¼ H. P. Capacity.

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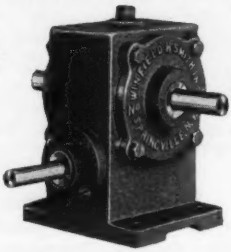

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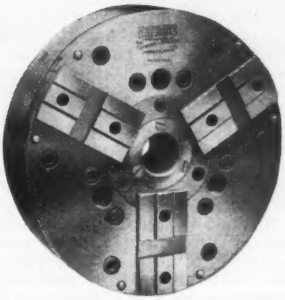

Larger jaws . . . Greater gripping power and centering precision . . . Hold work close to spindle bearing . . . Completely protected against dust and grit.
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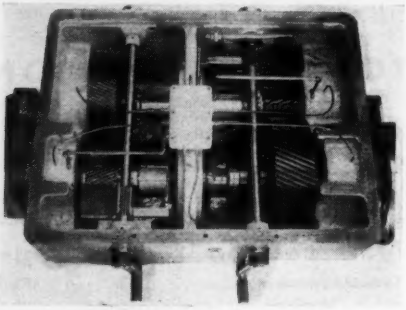
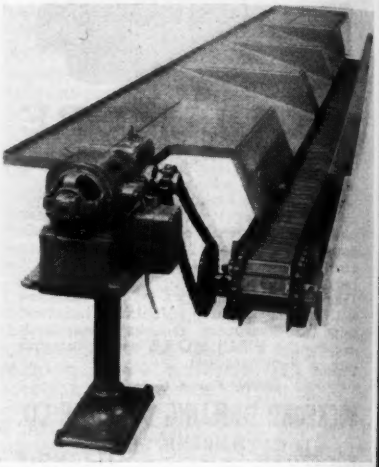
veyor, thus effectively overcoming danger to the operator and quickly and efficiently disposing of the chip.

The tailstock is of mammoth construction, weighing 40,000 pounds as compared with the 250-pound tailstock regularly furnished with a standard lathe of the same swing. This unit has a full length bearing on the front inner vee and on the wide, flat way at the rear. Eight large diameter bolts are used to bind it securely to the bed. A 7½-in. diameter, heat-treated steel spindle with built-in roller bearing center is housed in the massive barrel and actuated by a heavy buttress thread screw and heat-treated bronze nut. A large ball bearing is supplied for the thrust and powerful double plug binders for locking the spindle. Traverse of the tailstock unit along the bed is accomplished manually through a convenient geared actuating mechanism, provided with crank operation, or through a link connection to carriage by which the tailstock can be moved in conjunction with the carriage through the power rapid traverse mechanism.

The feed mechanism is entirely separate and functions independently of the lathe spindle. This mechanism is independently driven by a 6 to 1, 3 h. p., adjustable-speed motor located at the headstock end of the bed. A 50-contact rheostat and two-speed mechanical unit provide 100 rates of carriage feed, from 1¼ in. per min. to 43½ in. per min. A handwheel, revolving pointer and graduated dial control the motor speed and indicate the rate of feed. The entire feed mechanism is mounted on anti-friction bearings, and all gears are heat-treated and hardened and run in oil. A hardened jaw clutch in the mechanical speed change unit provides the disconnecting element for the automatic feed trip, which operates through an adjustable stop collar on the feed rod and a contacting plate on the apron, by means of which the carriage feed can be automatically tripped at any predetermined point without stopping the driving motor.



"American" Super-Lathe Head.



"American" Super-Lathe Motor-Driven Chip Conveyor.

Chips are disposed of by means of a motor driven chip conveyor, which, operating at a speed of 40 feet per minute, has a chip disposal capacity of 15 cu. ft. per min. The slope of the bed and chip pan directs the chips directly into the conveyor, which in turn deposits them into the removable collector bucket set into the foundation pit at the end of the conveyor. A very heavy box framed, steel follow rest, with a capacity of 1½ in. to 7 in., is attached to the right hand face of the carriage bridge. This rest is supplied with three round jaws having their work contacting ends tipped with Tantalum Carbide to resist wear.

Stackbin Machine Tender

The Stackbin Corporation, Pearl and Rice Streets, Providence, R. I., has brought out an enclosed sheet steel machine tender as shown in the illustration. The tender provides storage space for the chucks, tool holders, dogs, wrenches, and other tools that are especially intended for the machine for which the

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LET *Chicago Mounted Grinding Wheels* help. They go to the bottom of blind holes as well as clear through open holes of any depth.

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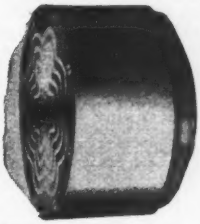
Standardize ON D & W Chucks



STANDARDIZATION pays, particularly when the tool is as far ahead of its class as the D & W chuck. Oil and waterproof, it is designed and constructed to give maximum holding surface with exceptionally strong and uniform pull throughout. Cables are protected by rubber tubing — special demagnetizing switches for readily releasing the work.

Complete information on request.

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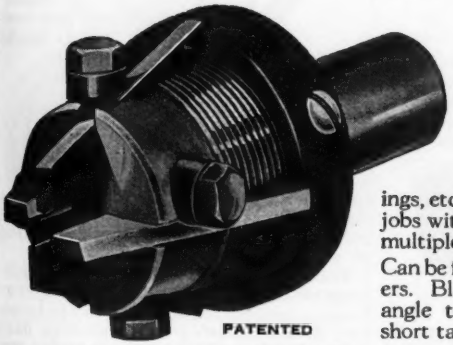
Made in 7 different styles



Has adjustable, replaceable blades and can be replaced at nominal cost, making it unnecessary to continually buy new tools.

The ideal tool for finishing your forgings, castings, etc. Do your several operation jobs with Genesee inserted blades multiple operation tools.

Can be fitted with drills and reamers. Blades can be ground any angle to point work and turn short tapers.

A Genesee Adjustable Hollow Mill can be made for every job

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GENESEE MANUFACTURING CO., Inc.
ROCHESTER, NEW YORK

tender is provided, or which are not kept in the tool crib. The top of the tender provides ample space for the mechanic's tool chest and is provided with a guard to prevent tools from falling off. A shelf divides the interior of the tender into two compartments in which the tools may be locked. A padlock hasp is provided on the doors for this purpose.

Stackbin Machine Tender

The tender rests on legs which raise it high enough from the floor so that the sweeper can clean under it. It is 18 in. deep, 30 in. wide, and 32 in. high. The finish is soft velvet green.

Armide Cutters

A cutting carbide that is said to be of a new type, an alloy instead of a cemented substance, with a toughness that makes it capable of withstanding shock, impact, and internal strain, to be known as "Armide," has been placed on the market by Armstrong Bros. Tool Co., 328 N. Francisco Avenue, Chicago, Ill. It is said to be exceedingly hard and wear-resisting, with a thermal conductivity so low that it remains cool and securely brazed even though the chips run red hot. Because Armide will not alloy with iron or steel, it is stated that chips will not weld to the cutting edge of the tool and cause it to break down, and thus Armide can be ground to a sharp cutting angle and can be run at a high speed with assurance of clean edges and smooth cuts.

Armide-Tipped Right Hand Turning Tool

It is said that the bits can be used not only for machining glass, bakelite, synthetic plastics and hard rubber, but for general metal cutting as well. Scaled cast iron, the toughest alloy steels, hardened steel, and other metals can be cut as easily as machine steel can be cut with high speed steel.

Armide-tipped bits are available in two types and in five ready-ground cutter forms. The bits are designed for use in Armstrong "Carbide" tool holders and other Armstrong holders. All forms are available on either "flat" or "square" bodies—the square bits for use in tool holders and the flat cutters for use where the maximum of strength is required.

Lufkin "Crescent Junior" Tape-Rule

A small, light-weight tape-rule, to be known as the "Crescent Junior," has been announced by The Lufkin Rule Co., Saginaw, Michigan. This tape-rule is a counterpart of the "Crescent," made by this company, but is smaller and lighter. It combines the practical utility of a rule with the accuracy and convenience of a pocket steel tape.

Lufkin "Crescent Junior" Tape-Rule

The blade is made in 4-ft. and 6-ft. lengths by $\frac{7}{8}$ in. wide and has the rigid feature which makes it possible to project it unsupported into openings like a rule. It is made of super-quality tempered steel, stiffened by special forming. The background is dark with markings in sharp contrast. Graduations are in inches to sixteenths.

The case is chromium plated, with rounded edges. The 4-ft. "Crescent

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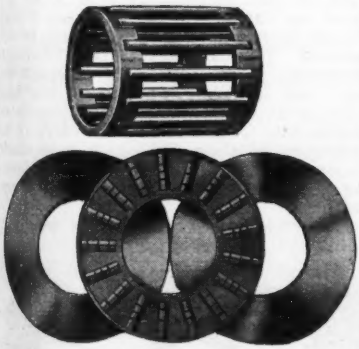

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Bond Backboard Brackets—Only 35c each, net.

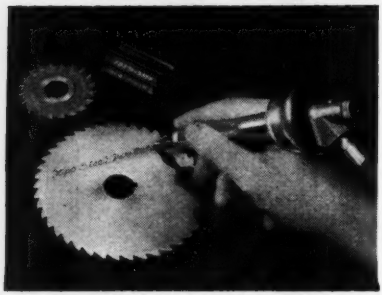
THERE aren't many pieces of equipment you could buy that only require $5.60 to prove their profitable value. Yet, that's all you need spend to convince yourself that the new BOND steel bench leg can be a real economy in your business. Everybody uses bench legs and we believe the BOND leg is the finest you can buy. Here are a few features: Box formation for strength; ribbed for additional strength; perpendicular leg for easier working; formed angle cross sections; no rivets, all electrically welded. The BOND leg has the best features of all of them, none of the weaknesses of the best of them. Try a set or two—you couldn't build them of crating lumber as cheaply. Your check for $5.60 or your name and address on the margin of this advertisement will bring you a set.

Bond Foundry & Machine Co.
Manheim, Lanc. Co., Pa.

Junior" is 1¾ in. in diameter and weighs 3 oz. The blade is automatically returned to the case by pressing the push button.

Kipp Steel Writer

By using the Kipp Steel Writer, made by the Madison-Kipp Corporation, Madison, Wis., it is claimed that hardened steel tools can be marked as easily as paper can be marked with a lead pencil. The Writer consists of an attachment that is used with the Kipp Model BB or Model AG Air Grinder, the slowest of which operates at a speed of 40,000 r.p.m. This speed is sufficient for efficient operation of the Steel Writer. This Steel Writer will find many uses in the machine shop, tool room, or laboratory.

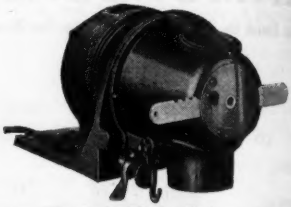


Kipp Steel Writer

France "Junior" Motor-Driven Insulated Wire Stripper

Insulation can be stripped from wire and the ends of the wire cleaned fast and economically by the use of the France "Junior" Motor-Driven Insulated Wire Stripper, made by The France Manufacturing Co., 10333 Berea Road, Cleveland, Ohio. The machine is power-operated by an electric motor that operates from the lighting circuit. It is easily adjusted to strip different forms of insulation from wires up to ½ in. in diameter, the change of adjustment requiring less than one minute. In addition to stripping, the machine twists stranded wire into a compact mass ready for soldering or for terminal connections.

The machine is simple and easy to operate, the operator being required only to insert the wire into the hole, press the foot pedal, and remove the wire, stripped instantly and cleanly. No pull is required. No skill is required; anyone can operate the machine after a moment's instruction.



France "Junior" Motor-Driven Insulated Wire Stripper.

The machine is of compact but sturdy design. Ball bearings are used throughout the motor and machine to promote ease of operation and long life. A motor can be supplied of any voltage and frequency, or for direct current. Weight, net, 43 lb. Packed, 52 pounds.

Vickers 4-Way Valve

More accurate and dependable control of the various types of hydraulic systems with operating pressures up to 2,000 lb. per sq. in. are said to be assured by the use of the Vickers 4-Way Valve, manufactured by Vickers, Incorporated, 7770 DuBois Street, Detroit, Michigan. The valve is of compact design and is easily applied to machine tools and other hydraulically-operated equipment. A feature of the valve is its hydraulic balance, by which it is made impossible for pressure to cause binding, thus assuring more sensitive operation.

The Vickers 4-way valve is made in three types. The one shown at the left in the illustration is the latch-controlled valve which makes one complete cycle and stops. This valve is peculiarly

(Left) Vickers Latch-Controlled 4-Way Valve. (Center) Vickers Pilot-Operated 4-Way Valve. (Right) Vickers Manually-Operated 4-Way Valve.

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adapted to press operations and similar work. The operator starts the machine and at the end of the stroke a stop trips the latch and allows an internal spring to shift the valve to reverse position. When the end of the return is reached, the machine is stopped by the valve.

The pilot-operated 4-way valve with manual and mechanical pilot valves is shown in the center group; this valve provides remote control without the use of levers, links, and so on, and can be placed wherever most convenient. Simple external adjustments are provided for controlling the reverse speed, which feature is used to eliminate shock from rapidly-moving tables.

The manually-operated 4-way valve is shown at the right.

Sunlight Frame No. 400 Series Electric Motor

The illustration shows the Frame No. 400 Series Electric Motor which has been placed on the market by Sunlight Electrical Manfg. Co., Warren, Ohio. This motor is built to conform to the same basic principles of design and construction as the DeLuxe Series made by this company, embodying the same high starting torque, switch mechanism, and oversize bearing.

When operated on its normal voltage, this motor will start a load slightly in excess of twice the full load torque, and the breakdown or "pull-out" torque is said to be greatly in excess of Power Club ratings. A maximum temperature rise of 40 degrees C. is assured for constant duty at full load conditions. The motor is made in ⅛, 1-6, ¼, 1-3 hp., alternating current, induction type only in 110 volt, 60 cycle, regularly furnished with ½-in. shaft. A 10-ft. all-rubber Belden cord and plug are furnished as standard equipment.

Sunlight Frame No. 400 Series Electric Motor.

Aetna Oil Seal

Anti-friction bearings have found so many new applications during the past year or so that the need for a seal which will hold both oil and grease and which will keep grit, dirt, and water out of the bearings has become increasingly real. To meet this condition the Aetna Oil Seal has been placed on the market by the Aetna Ball Bearing Manfg. Co., 4610 Schubert Avenue, Chicago, Ill.

Cross-Section View of Aetna Oil Seal, Showing the Four Component Parts Assembled.

The Aetna Oil Seal consists of four parts and is a self-contained and complete unit which can be slipped in or out of position. It consists of an outer shell of steel, accurately formed and ground to a precision commensurate with that of anti-friction bearings. This shell houses the seal cushion, pressure plate, and steel retainer.

The thermo-pneumatic seal cushion consists of the specially-treated cork in which the interstices or air cells are captivated and hermetically sealed. This pneumatic seal cushion automatically expands and contracts laterally with changing temperature of shaft or lubricant, remaining always oiltight in consequence. It is non-hydroscopic and impervious, is of great resiliency, has a low friction co-efficient, and is abrasive resistant. The deflector pressure plate, which is of dense, specially-treated fiber, deflects oil from the seal proper, serving to maintain a constant and steady pressure upon the pneumatic cushion and a uniform pressure over the entire periphery of the seal while relieving it of ex-

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Threaded Models have many advantages over the regular key operated chuck.

Light in weight—long life—quick change of tool—for Morse Taper or straight shank drills—low initial cost and upkeep.

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IN PERKINS GEARS and WORMS you get superb quality. Our years of experience—use of specially designed manufacturing equipment—strict adherence to highest standards of workmanship—and the use of finest quality materials guarantee complete satisfaction in PERKINS GEARS—gears for all purposes.

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Sprockets -:- Speed Reducers -:- Flexible Couplings

traneous internal pressure. In this way the pneumatic seal is always maintained concentric with the shaft and is relieved of longitudinal pressure, thus overcoming a common cause of leakage. It is claimed that this seal will hold oil as well as grease and will operate without trouble where water is held on one side of the seal and oil on the other.

The Aetna Oil Seal requires no pretreatment or special precautions for use; it can be taken from stock and put to immediate use. Because of its compact design it is very thin and can be used in cramped space, and is interchangeable with all makes of grease seals. The seal is available in sizes from ½ in. inside diameter and up.

Nugent Shaft Oiler

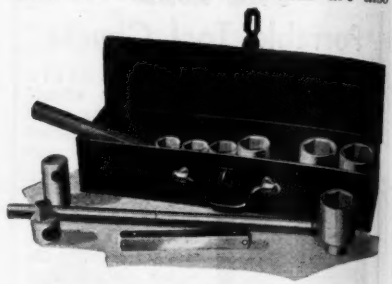
Accidents resulting from necessity of climbing ladders to oil line and countershaft bearings can now be avoided by the use of the Nugent Shaft Oiler. The oiler consists of a two-quart oil can of the plunger type, to which is attached a spout of aluminum tubing, the spout being long enough so that the bearings can be oiled while the operator is standing on the floor.

Nugent Shaft Oiler in Use.

The pump barrel and valve seats are made of a single brass casting, carefully machined. The plunger, ball check valves and springs may easily be removed for examination. The opening for the long spout is tapped with a ⅛-in. pipe tap, making it possible, by using an elbow at this point, to set the spout at right angles or at 45 degrees. The oiler is made by Wm. W. Nugent & Co., 410 N. Hermitage Avenue, Chicago, Illinois.

Bonney No. XH Extra Heavy Duty Socket Set

An extra heavy duty socket wrench set is now being offered by Bonney Forge and Tool Works, Allentown, Pa. The set consists of seven hexagon sockets with openings of $1\frac{7}{16}$, $1\frac{1}{2}$, $1\frac{5}{8}$, $1\frac{11}{16}$, 2, $2\frac{1}{16}$, and $2\frac{3}{8}$ in. A 9-in extension, an 18-in. extension, a 22-in. sliding bar, and male and female drive heads are also



Bonney No. XH Extra Heavy Duty Socket Set.

included, all with 1-in. square drives. The set comes in a substantial carrying case 23 in. long, 5½ in. wide, and 4½ in. high.

Weldon Hollow-Ground End Mill

Clean cutting and freedom from chattering are the advantages claimed for the end mills with hollow-ground lips that are now being marketed by The Weldon Tool Co., 1426 West Third Street, Cleveland, Ohio. It is said that the hollow-ground design not only aids the cutter to retain its sharpness, but also that the "hook" effect of the hollow-ground lip curls the chips, leaving a clean finish and enabling a higher speed to be utilized. The mill is supplied in either right or left hand, and with either right or left hand spiral.

Drawing Showing "Hollow-Ground" Lip Design of Weldon End Mill.

Foster Speed Calculator

Time study engineers and others who are concerned with the correct cutting speeds of machine tools will be interested in the speed calculator that has been placed on the market by the Foster Machine Co., Elkhart, Ind. The calculator may be used in conjunction with practically any type of machine tool, for selecting the spindle speeds

The surface feet plate lists the recommended cutting speeds for different kinds of materials. After the surface feet have been determined, the spindle speeds for the different diameters are quickly and accurately selected by turning the drum of the calculator until the figures corresponding to the diameter of the work, as listed on the left of the drum, appear just above the surface

Foster Speed Calculator.

feet plate. The correct spindle speed will appear just above the surface feet selected.

The spindle speeds for milling cutters and drills are selected in like manner, by using the diameter of the drill or cutter in place of the diameter of the work. The end of the calculator to which the surface feet plate is attached may be turned to locate the plate at any desired position.

Gisholt Special Machine to Machine Rabbet Fits On Electric Motor Frames

Since the "rabbet" fit on an electric motor frame locates the bearing brackets, or end shields, which in turn align the rotor with the stator, the machining of these fits must be extremely accurate. To aid in the fast and accurate performance of this operation, the Gisholt Machine Company, Madison, Wis., has designed a special machine with which the rabbet fits on both ends of a frame can be machined in from 3 to 4 2/3 min., floor to floor. The machine has a 44-in. swing and carries one adjustable fixed carriage and one traversing carriage on flat ways. The carriages each carry three tool slides and contain the cams and mechanism for actuating the slides.

An air-operated expanding mandrel, attached to the spindle and supported in both carriages, is provided to hold the frame. The frame is located longitudinally by a locater stop mounted on top of the fixed carriage. When the air is turned on, the piece is firmly gripped in the bore of the punchings by three wide-faced jaw inserts. The traversing car-

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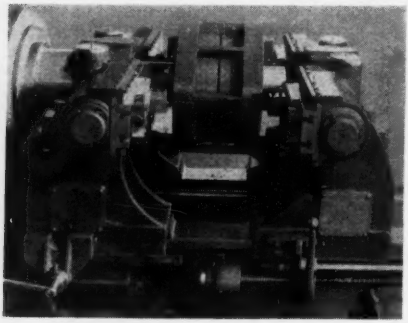
riage is then moved up to the work by power and a ball bearing center support or pilot, mounted in the housing, enters the end of the expanding mandrel to provide additional rigidity and accuracy.

As the work starts rotating, tools on the front slides start feeding in to rough out the fits. At the end of the cut the tools stand for five revolutions of the



Gisholt Special Machine to Machine Rabbet Fits on Electric Motor Frames.

work and then retract 1/32 in. At the same instant the finishing tools start cutting, and at the finish, chamfering tools remove the burrs. At the end of the finish cut, sizing tools start cutting, finishing the fits to within 0.002 in. At the completion of this cut, the slides return to starting positions.

Cemented tungsten carbide tools are used to the limits of their possibilities as regards speeds. Besides the eighteen sizes or frames for which the machine is tooled, a similar series of frames with female rabbet fits may be handled by the addition of special tool blocks and tools.

Engineering Data Book on Roller Chains and Sprockets

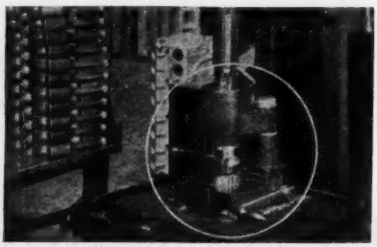
The Chain Belt Company, 1600 West Bruce St., Milwaukee, Wis., has put out its No. 440 Catalog, which is also a complete engineering data book on the design and uses of roller chains and sprockets. The book contains chapters on the arrangement of the drive, vibration and its avoidance, lubrication, selection of the chain and sprockets, and so on, with tables of horse power, and charts showing dimensions of chains and sprockets, chain velocities, methods of figuring lengths of chain and center distances, sprocket diameters, pitch, shafting, and other facts pertinent to the use of roller chain.

A number of useful tables for the engineer are also included.

The book contains 112 pages, 7¼ x 11½ in. in size, with illustrations in colors, and is bound with a stiff cover of blue and gold. A copy of this book can be had by any engineer or mechanical executive who will address this firm on his firm letterhead.

Reference Book on Stampings

In order to assist machine designing engineers to intelligently incorporate into their specifications definite facts and figures regarding metal stampings, The Geometric Stamping Co., 1111 East 200th Street, Cleveland, Ohio, has published a reference book on this subject. The book consists of 28 pages, profusely illustrated with charts, graphs, and tables. The information contained will be valuable to anyone who is using stampings, forgings, or castings. The book is priced at one dollar, but a copy can be had by any designing engineer or mechanical executive who will address his request on his firm letterhead and mention this magazine.



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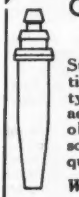
Schedule Methods for Maintenance

(Continued from page 16)

which the control board is maintained or by some section of the accounting or other departments, the above work record should be kept in separate parts, one part for construction and the other for maintenance. The work order for construction could be called a "C.O." and the maintenance order an "M.O.," or the use of "C" and "M" prefixes could be adopted.

Fig. 3 is a common form used for these purposes. Of importance are the summary schedule on the reverse side and the estimated cost, assignments and completion dates on the face of the form. The setting up of the summary schedule will always indicate the extent of co-ordination of functions and if there is any possible error in schedule arrangements. If actual charges or possibly commitments are collected under the above numbers in the accounting or cost department through a job ledger, then the estimated cost and the detail supporting this estimate can be paralleled for purpose of comparison, against the cost figure.

When each function is completed, the work order ticket will be returned and the card removed from the board. In large organizations, check-ups can be made by men who will report on each job periodically. In this way the schedules on the board will be corrected and maintained up to date.



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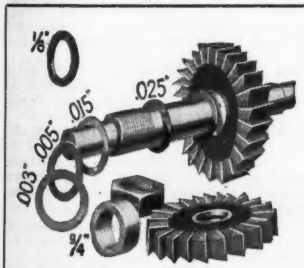

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Pointers on Internal Grinding: A folder containing data on the selection of internal grinding spindles, selection of grinding wheels, methods of holding work, grinding bushings, grinding holes with keyways or slots, and other useful information will be sent free to any machine shop executive. Address Abrasive Company, Tacony and Fraley Streets, Philadelphia, Penna.

Cut Your Sawing Costs: "Lenox" hack saw blades and band saws are guaranteed to effect savings on your sawing operations. Write for information to American Saw & Mfg. Co., Springfield, Mass.

Ames Gages: Catalog No. 50, issued by the B. C. Ames Company, Waltham, Mass., contains complete descriptions and illustrations of the dial gages, gage heads, upright gages, cylinder gages, dial micrometers, and precision verifiers, special gages and attachments made by this company. Copy free upon request.

Scraping By Power: Bearing surfaces can now be scraped with a power scraper that is quicker and easier than the old-fashioned hand method. The tool is described in a folder that is issued by Anderson Bros. Mfg. Co., 1926 Kishwaukee St., Rockford, Ill. Sent free on request.

Steel Furniture for the Shop: The complete line of steel furniture made by the Angle Steel Stool Co., Plainwell, Michigan, including steel stools and chairs, steel foremen's desks, lockers, tables, tool stands, machine tenders, shop boxes and pans, iron bar racks, trucks, bench legs, and bench drawers, is described and illustrated in Catalog "C," which is issued free to machine shop executives.

Stop Tap Breakage: A booklet that tells how to stop the breakage of taps, reamers, and other tools, by the use of a friction chuck, also how to use the chuck for setting studs or nuts, has been issued by The Apex Machine & Tool Co., 200 Davis Avenue, Dayton, Ohio. Sent free upon request.

Machine Shop Accessories: Catalog B-27, issued by the Armstrong Bros. Tool Co., 328 N. Francisco Ave., Chicago, Ill., describes the line of tool holders, boring tools, wrenches, pipe tools, ratchet drills, lathe dogs, and other tools manufactured by this company.

Hold Odd-Shaped Pieces Securely: A vise in which odd-shaped work can be held securely without the need of special jaws or fixtures is described in a folder that has been issued by The Avey Drilling Machine Co., P. O. Box 487, Cincinnati, Ohio. Copy free upon request.

Hobs and Milling Cutters: A complete line of milling cutters and hobs for cutting all kinds of gears, splines, sprockets and other forms is described in Catalog G, issued by the Barber-Colman Company, Rockford, Ill. Descriptions and illustrations of the Barber-Colman hobbing machine and hob-sharpening machines are included. Sent free on request.

Greenerd Arbor Presses: Catalog No. 36, issued by the Edwin E. Bartlett Co., Nashua, N. H., describes and illustrates all the various types and sizes of arbor presses made by this firm. Copy free upon request.

Automatic Oiled Die Sets: The automatic oiled die sets, die shoes, punch holders, leader pins, bolster plates, bushings, and other standard die parts made by the E. A. Baumbach Manfg. Co., 1806 S. Kilbourn Ave., Chicago, Ill., are described in Catalog No. 5, which has been issued by that company. Sent free upon request.

Steel Bench Legs: The complete line of steel bench legs made by the Bond Foundry & Machine Co., Manheim, Lancaster Co., Pennsylvania, is described and illustrated in a folder that will be sent upon request.

How To Sharpen Staggered Tooth Cutters, Helical Milling Cutters, and Two-Lipped End Mills: A series of pamphlets on these subjects can be obtained without charge by addressing the Brown & Sharpe Mfg. Co., Providence, R. I.

Abrasives: Samples of "Aloxite" Brand "TP" Polishing Grains for trial may be had without charge by addressing the Carborundum Co., Aloxite Division, Niagara Falls, N. Y.

Gears Of All Kinds are described and illustrated, with specifications, in Catalog 80, which has been issued by the Chicago Gear Works, 105-9 S. Jefferson St., Chicago, Ill.

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Grinding Wheel Dressers: All of the different types of grinding wheel dressers made by the Desmond-Stephan Mfg. Co., Urbana, Ohio, including Desmond-Huntington, Desmond-Sherman, Zig-Zag, Diamo-Carbo, and diamond dressers, are described and illustrated in a catalog that has been published by the firm mentioned. Free upon request.

Steel Spacing Washers: Milling jobs can be set up quicker by using standard spacing washers, made by Detroit Stamping Co., 3445 West Fort Street, Detroit, Michigan. Write for information.

Interchangeable High Production Tools: Catalog No. 28 issued free by the Eclipse Counterbore Co., 7410 St. Aubin St., Detroit, Mich., describes and illustrates the interchangeable counterbores, spot facers, end form cutters, and other end cutting tools made by this firm.

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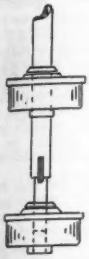

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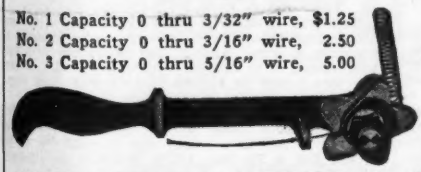

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"The Birth of a Notion," published by the National Boring Tool Co., 8619 Mack Avenue, Detroit, Michigan, describes the design, construction, and use of a ball-bearing rotary jig and pilot bushing. Copy free upon request.

"The Answer to Your Gear Problems": Information as to correct methods of cutting and finishing gears will be supplied without charge by The National Tool Co., Cleveland, Ohio. This firm also carries a complete stock of gear shaper cutters and markets the National-Cleveland Spur and Helical Gear Grinding Machine.

Ball and Roller Bearing Data Sheets: A complete set of data sheets showing all the dimensions and loads at given speeds, and giving instructions for mounting precision ball bearing and Hoffmann roller bearings, can be obtained without charge by addressing the Norma-Hoffmann Bearings Corporation, Stamford, Conn.

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Die Making Machines: How dies, templates, gages, etc., can be sawed out, filed, and lapped easily and accurately on Oliver die making machines is fully described in a bulletin issued by the Oliver Instrument Company, 1430 Maumee Street, Adrian, Mich. Mailed upon request.

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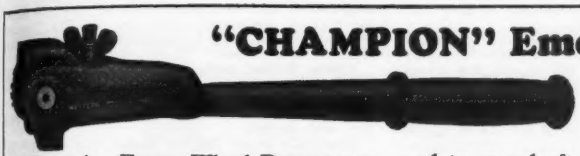

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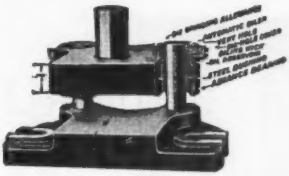

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Chuck With Air: How time and labor can be saved by the use of air-operated chucks, cylinders, and other equipment is told in a book which describes "Hopkins" Air-Operated Equipment. Published by The Tomkins-Johnson Company, 620 N. Mechanic St., Jackson, Mich. Sent free upon request.

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How To Measure Threads with Wires: Circular W32, issued by The Van Keuren Co., Watertown, Mass., tells how to obtain the correct thread pitch diameter with a micrometer and wires. Copy free upon request.

Tool Chests for Machinists and Toolmakers: The complete line of fine tool chests for machinists and toolmakers made by J. M. Waterston, 420 Woodward Ave., Detroit, Mich., is described in Catalog No. 25. Ask for it.

Double-Life End Mills: Wel-don double-end type end mills, made with blades on each end, are described in a circular that can be had by writing The Weldon Tool Co., 1426 West Third Street, Cleveland, Ohio.

Shop Furniture: A catalog describing and illustrating all kinds of shop furniture, including benches, vises, steel stands, foremen's desks, chip trucks, steel racks for bar stock, steel tote boxes, and other equipment will be sent free upon application to The Western Tool & Manufacturing Co., 1620 East Pleasant Street, Springfield, Ohio.

Wrenches For Every Use: "Guaranteed Against Breakage" tappet wrenches, pipe and fitting tongs, offset wrenches, and wrenches for all other uses are described and illustrated in a series of folders which can be obtained without charge by addressing J. H. Williams & Co., Buffalo, N. Y.

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Main Dining Room & Coffee Shop with electrically cooled & purified air the year 'round
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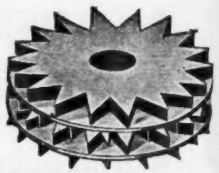

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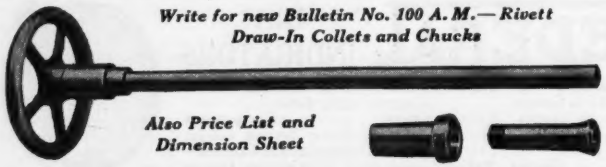
DESMOND-STEPHAN MFG. CO.
URBANA, OHIO

Write for new Bulletin No. 100 A. M.— Rivett Draw-In Collets and Chucks



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COLLET ATTACHMENTS for YOUR LATHES and MILLERS

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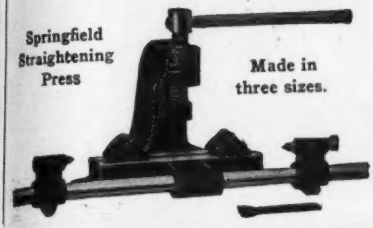

THE Springfield Straightening Press is the ideal tool for straightening any length of rough or finished work—truing sprung tools—testing and balancing cams, or crank shafts—and scores of other jobs.

Place it on the bench—it saves your operators' time by eliminating waste steps, and allowing quicker handling of work.

Send for illustrated folder suggesting many uses.

The Springfield Machine Tool Co.
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We also manufacture Engine Lathes and Shapers.

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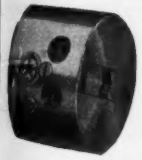

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WATERSTON'S 420 Woodward Ave. Detroit, Michigan

work in the dark

WHAT kind of steel is it? Is it oil hardening or water? What job is the tool for? What is the job number? Who made it?

These questions are answered economically and speedily if the article is properly marked.

Schwerdtle Steel Alphabet and Figure dies in sets, are designed for just such work as marking dies, tools, parts, and for all miscellaneous marking.

The simplest mistakes are the costliest, and the remedy for them is very inexpensive.

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SPEED SPOT WELDERS

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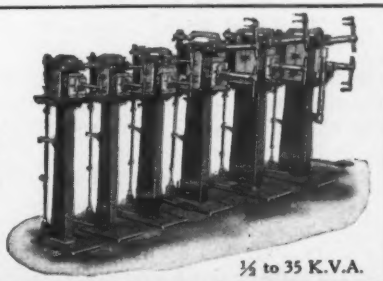
Distributor and Dealer Connections Desired



1/2 to 35 K.V.A.

By GEO. ALEXANDER MANN

Life's not much to look at till you see its funny side.

Sez Myrt

I got a boy friend,
I'll say he is warm,
I call him cyclone,
He took me by storm.

It's when she dresses the coolest she looks the hottest.

Poor Elmer

Elmer, the drug clerk,
Was fired (poor nook)
The boss found out
He couldn't cook.

All that seems to save some men is their ability to cash in on their blunders.

Have a Heart

If she bums a cigarette
Don't bawl her, brother,
Remember she may be
Your best friend's mother.

In the old days the girls wanted to be looked up to—now all they seem to care about is bein' looked around at.

Jes' Nuts, Tha's All

'Bout ridin' in them air planes,
I am sure a funny lout,
All the time I'm up and in
I wanta be down and out.

Many a jane keeps her love letters with the hope that some day they'll keep her.

Too Fresh

"You had some fresh shrimps
Last week," said Hiram,
"You're right," said the Butch,
"I had to fire 'em."

It's easy to learn to love—it's the tuition that burns you.

Maw says when a man asks a woman to share his lot what he means is lot o' trouble.

'Tis Tuff

"When the right man
Comes along," sez Myrt,
"Hangin' on his arm
Is some other skirt."

They say the elephant never forgets. Huh—the chances are it'll never forget this administration.

And It Probably Is

One o' the best ones we heard lately is the radio announcer on the tobacco company hour braggin' 'bout their cigar bein' the best out.

When a woman waives her rights it isn't a permanent waive.